ANNUAL REPORT

OF THE

Oregon Agricultural College

AND

Experiment Station

FOR THE YEAR ENDING

JUNE 30, 1898.

AGRICULTURAL COLLEGE PRINTING OFFICE.
GEO. B. KEADY, PRINTER.
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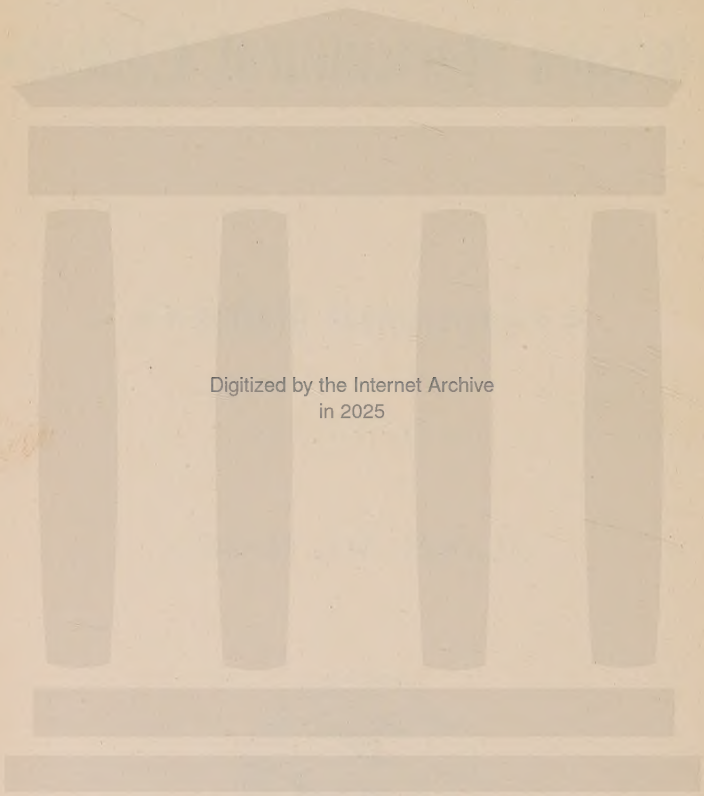

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ANNUAL REPORT

OF THE

OREGON AGRICULTURAL COLLEGE AND EXPERIMENT STATION, 1898.

REPORT OF THE PRESIDENT OF THE BOARD OF REGENTS.

To His Excellency, W. P. Lord, Governor of the State of Oregon:

SIR:—In compliance with the laws of this state as president of the Board of Regents of the Oregon Agricultural College, I have the honor of submitting to you this the twenty-eighth annual report of this college for the year ending June 30, 1898.

The experiment station provided for by act of congress approved March, 1887, was by act of the Legislative Assemby of the State of Oregon approved February 25, 1889, placed under the control of the Board of Regents of the Oregon Agricultural College, and in conjunction with said college under the management of said Board of Regents. This completes the tenth year of the work of said experimental station.

In submitting to you this report of the work of the college and station for this year, it is a matter of great satisfaction to me to be able to state to you that this year's work of the college and station has proved fully equal to the work of these institutions for the most successful year of their history.

Professor T. M. Gatch, as president of the college and director of the station, has during the year fully demonstrated and proved himself as eminently able and well qualified to manage and direct the great and important work of this institution, confided one year ago to his charge. He has fully sustained and equaled all that could have been claimed for him by his most sanguine friends.

He has received the hearty support and assistance of each and all of the professors, teachers and employes under his charge. In fact there has been nothing during the entire year to which my attention

has been called, that would indicate any but the most earnest and zealous co-operation by all the members of the college and station staff. This is commendable alike to Professor Gatch and each of the professors, teachers and employes of this institution.

The enrollment of students during the year was three hundred and thirty-six. This will indicate to you, when compared with the attendance in previous years, that this institution is being fully sustained.

The young men and women who have attended this institution during this year are justly entitled to favorable commendation for their good conduct. It reflects credit upon them, their parents, friends, and the professors and teachers of this institution. This is especially gratifying to the managers of this institution.

The number graduated this year is twenty-nine. Their attainments will compare favorably with the attainments of any previous year's class. Each year young men and women from different sections of this state are here being prepared and instructed in those principles of an industrial education that will fit and qualify them to be more useful and better citizens of this great country.

We cannot refrain from expressing to you our appreciation of the manifest desire of the graduates and pupils of this school to respond and offer their services to our state and nation when assailed.

At one time it seemed that this college would be almost deserted by the young men in attendance, so great was their desire to respond to the call of the President of the United States recently made upon you for Oregon's quota of men to assist in vindicating and upholding our national honor. While we regret the necessity of a resort to arms, we cheerfully commend these brave and loyal young men for their patriotism. Their zeal and earnest desire to respond clearly demonstrates the wisdom and good policy of the general government in requiring that institutions of this character should give military instructions. This should be sustained and encouraged by all good law-abiding citizens of this state.

Lieutenant W. Geary, of the 19th United States Infantry, who was assigned as military instructor at this college, upon the declaration of war, asked to be re-assigned by the Department to his regiment, and his request was granted, depriving this institution of the services of one whose action should be commended. He would not have been, in my judgment, a proper instructor for our young men if he had not wanted to go to the front. His action should

elevate and commend him favorably in the esteem in which he is to be held by all loyal cizizens and especially by members of the managing board of this college.

I herewith submit to you as part of this report a copy of the reports of the president of the college and director of the station, giving in detail the amount of the work of this institution for the year ending June 30, 1898.

FINANCIAL EXHIBIT.

COLLEGE FUNDS.

Balance on hand July 1, 1897	$ 528.05
Amount received from U. S., as per Morrill Act	23,000.00
Amount received from State interest on said funds	12,553.85
Amount received from sale of farm, etc.	
Amount received from miscellaneous sources	621.45
Total to be accounted for	$36,703.35

DISBURSEMENTS OF COLLEGE FUNDS.

Printing	$ 840.73
Agriculture	2,174.98
Horticulture	1,390.48
Botany	731.37
Chemistry	1,497.05
Photography and Drawing	893.00
Entomology	1,219.85
Mechanics	4,740.53
Household Economy and Hygiene	2,494.48
Military	500.48
Salaries outside of departments	11,048.32
Fuel, furniture and sanitary	1,160.60
Advertising and traveling expenses	666.15
Insurance and care of grounds	663.59
Library and miscellaneous expenses	2,409 93
Total	$32,469.41
Less amounts paid from improvement fund	1,359.57
Actual amount paid from college funds	$31,109.84
Balance on hand	5,593.51
Total to be accounted for	$36,703.35
Balance in state interest fund $5,100.94	
Balance in chemical breakage fund 406.12	
Balance in miscellaneous fund 86.45	
	$ 5,593 51

STATION FUNDS.

Amount received from U. S. Treasurer as per Hatch Act	$15,000.00
Amount received from sale of products of station	1,305.15
Total to be accounted for	$16,305.15

DISBURSEMENTS OF STATION FUNDS.

Printing	$ 1,183.27
Agriculture	3,003.81
Horticulture	2,126.03
Botany	900.17
Chemistry	2,293.91
Photography and Drawing	459.63
Entomology	711.03
Salaries outside of departments	1,094.99
Advertising and traveling expenses	471.38
Library and miscellaneous	1,755.78
Local station account	67.84
Balance on hand July 1, 1898, (local station fund)	1,237 31
Total amount accounted for	$16,302 15

IMPROVEMENT FUND.

Balance on hand July 1, 1898	$ 2,464.55
Received from sales and products	640.27
Received from miscellaneous sources	25 25
Amount received from Treasurer, Act of February, 1889	5,000.00
Total to be accounted for	$ 8,130.07

DISBURSEMENTS OF IMPROVEMENT FUND.

Amount expended on improvements of grounds, and building of college and station	$ 2,309.72
Balance on hand July 1, 1898	5,820.35
Total amount accounted for	$ 8,130.07

For a more full and complete detailed statement of the receipts and disbursements of the several funds of this college and station, I would respectfully refer you to the reports of the secretary and treasurer of this board, a copy of said reports is herewith attached and made a part of this report.

Under the provisions of the act of the Legislative Assembly of the State of Oregon approved February 18, 1889, there was appropriated five thousand dollars annually for the support and maintenance of the Oregon Agricultural College.

This appropriation was not drawn by the Board of Regents from January 1, 1893, for four years.

It having become necessary to provide additional and suitable accommodations to enable the Board to carry on the work of the college, the Board of Regents decided to ask for the amount of said appropriation, since January 1, 1897; with this money the Board decided to erect and equip a suitable armory and physical culture building so as to better the accommodations of the young men and women who are in attendance at this institution.

With this money it is earnestly hoped that we can secure the completion of said building and have it ready for use at the opening of school this fall.

This will add greatly to the present convenience and accommodation and enable those in charge of the work of the college to accommodate much better not only the present number of students, but will give them room to greatly increase the number of students that can be accommodated at this institution.

Owing to the present condition of the buildings and fences, it is necessary to preserve them, and there will have to be quite a sum of money expended during the coming year.

The sanitary condition of the buildings and outhouses of this college and station is in a very bad condition and should be improved. This will probably entail quite an expenditure of money.

I am of the opinion that the Legislature of Oregon, at its next term, should make an appropriation of at least twenty thousand dollars, that may be applied to the improvements required.

This sum would not be sufficient to enable the Board to make all the improvements that are required at the college and station, but would greatly improve this valuable property, and enable the Board to greatly increase the work of the persons now engaged at this college and station.

The general government, having made provision for the teaching work at this institution, it devolves upon the people of this state to make provision for grounds, buildings, and keeping same in repair. If our people are to reap the full benefits that may come to them from the money received from the general government, they will have to make provisions to greatly extend the improvements on the college and station grounds in the near future.

It is estimated that the amount received from the general government, with the interest on the money derived from the sale of lands granted the state for the support of this college and station will be ample to meet all the purposes for which said funds can be applied during the coming year.

Respectfully submitted,

J. T. APPERSON,

President of the Board of Regents.

TREASURER'S REPORT.

To the Board of Regents of the Agricultural College of Oregon:

GENTLEMEN:—I herewith submit my report for the year ending June 30, 1898, together with a copy of the checks issued on each fund.

GENERAL STATEMENT—ALL FUNDS.

BALANCES ON HAND JULY 1, 1897.

Station	$	
College		
State interest	1.64	
State improvement	1,500.78	
Agricultural receipts (Tr. to Imp. F.)	564.80	
Dairy " " "	381.82	
Horticultural " " "	17.15	
Chemical breakage	439.96	
Miscellaneous	86.45	
		$ 2,992.60

INCOME FOR THE YEAR 1897–1898.

Station	$15,000.00	
College, Morrill	23,000.00	
State interest	12,553.85	
State improvement		
Chemical breakage	368.25	
Miscellaneous		
Local station		
Special (armory)	5,000.00	
Uncashed checks returned	142.10	
Tuition	95.00	
Agricultural receipts	538.95	
Dairy "	555.02	
Horticultural "	30.55	
Entomological "	16.75	
Miscellaneous "	25.00	
		$57,325.47
Total revenue for 1897–1898		60,318.07

DISBURSEMENTS FOR THE YEAR 1897–1898.

Station (see transcript attached)	$15,000.00	
College " "	23,229.10	
State interest " "	7,478.65	
State improvement " "	2,180.07	
Chemical breakage " "	402.09	
Miscellaneous " "		
Local station " "	67.84	
Special, armory " "	129.65	
Total face of checks drawn	$48,487.40	
Less a transfer check from state improvement fund to local station fund by order of Regents	820.50	
Actual expenditures		$47,666.90
Balance on hand June 30, 1898		$12,651.17

BALANCES BY FUNDS.

Station	$	
College		
State interest	5,100.94	
State improvement	950.00	
Chemical breakage	406.12	
Miscellaneous	86.45	
Local station	1,237.31	
Special, armory	4,870.35	
		$12,651.17

DETAILED STATEMENT OF EXPENDITURES BY DEPARTMENTS,

1897-1898.

Printing	$ 2,024.00	Furniture	51.50
Agricultnre	5,178.79	Traveling expenses	788.10
Horticulture	3,516.51	Advertising	849.43
Botany	1,631.54	Fuel	930.97
Chemistry	3,790.96	Insurance	299.74
Chemical breakage	402 09	Care of grounds	363.85
Photography and drawing	1,352.63	Library	1,017.32
Entomology	1,930.88	College building repairs	111.90
Mechanics	4,740.53	Station building repairs	28.38
Household Economy	2,498.48	Miscellaneous	2,837.36
Military	500.48		
Salaries outside departments	13,143.31	Total	$47,666.90
Sanitary	178.15		

"Miscellaneous" is made up of postage and stationery and telegrams, freight and express, new buildings, armory, local station bills, tuition, scientific apparatus and miscellaneous expenditures.

J. K. WEATHERFORD, Treasurer.

REPORT OF THE PRESIDENT.

To the Honorable Board of Regents of the Oregon Agricultural College:

GENTLEMEN:—I beg leave to submit my report for the collegiate year ending June 22, 1898.

ATTENDANCE.

We have enrolled nineteen more students this year than were enrolled last year. This is not a large increase but it is enough to show that the people of the state still appreciate the advantages afforded by our college.

The enrollment by classes is as follows:

Freshmen	151
Sophomores	75
Juniors	45
Seniors	26
Special students	24
Graduate students	15
Total	336

Attendance from various counties is as follows:

Benton	130	Wallowa	2
Linn	35	Wasco	2
Polk	29	Lincoln	2
Clackamas	19	Union	2
Marion	18	Crook	2
Yamhill	17	Jackson	1
Lane	11	Malheur	1
Washington	14	Morrow	1
Douglas	9		
Coos	8	Total from Oregon	330
Multnomah	8	State of Washington	3
Gilliam	6	State of California	2
Josephine	6	State of Montana	1
Clatsop	4		
Baker	3	Grand total	336

Without explanation this exhibit would favor the assertion that our college is a local institution, deriving its patronage to a large extent from Benton county. The fact is that many families have come to Corvallis on account of the college and students from these families give Corvallis as their postoffice address. If due attention were paid to recording the former homes of students, the number assigned to Benton county would be diminished one half, and the rest would be distributed among the other counties of the state.

COURSES OF STUDY.

Frequent changes in courses of study tend to mystify and discourage students. On trial, however, we found that the courses as laid down in last year's catalogue were too crowded in certain terms. In fact, in one or two terms, there were hardly hours enough in the day to enable the classes to recite according to the courses. Besides, certain science studies were so crowded into the spring term as to allow our station men little or no time for station work in the most opportune season for this work. These objections have been removed by the Faculty by a readjustment without omitting any of the studies. Our Household Science Course has been enlarged and made co-extensive with the other courses.

While asking the Regents to approve these changes, I beg leave to express the hope that the time is not far distant when a student, if he so elects, may substitute in each term a language—German, French, or Latin—for one of the studies scheduled for that term.

DISCIPLINE.

Educators have learned that strict fraternalism towards students has a bad influence. The freer students are to look after their own affairs the better their conduct. The claptrap of what is usually called discipline—demerits, public reproofs, suspensions, and expulsions—is often looked upon by the student as a challenge to do wrong and the challenge is accepted accordingly. Espionage on the part of instructors casts a glamour over wrong doing on the part of students and tempts them to do evil. Numerous rules relating to the conduct of students have been stricken out during the past year and the students in response have shown a high appreciation of the faith reposed in them. A few have failed in their studies and have been conditioned or placed in lower classes, but there has not been a single case of discipline during the year. I believe that, as a class, better behaved and more refined young people are not to be found in any school.

ELECTRICAL ENGINEERING.

Mr. E. G. Emmett, having resigned his position as assistant in mechanical engineering, I deemed it expedient, after consulting with the President of the Board and the head of the department to do without an assistant until we could find one skilled in both mechanical and electrical engineering. We accordingly entered into

correspondence with professors at Cornell, Stanford and Berkeley, which resulted in our choosing Ernest C. Hayward, a graduate of Stanford and highly recommended by Professor Perrine of that university. Mr. Hayward was employed for the time being at a salary of $700.00 and reported for duty Jan. 4, 1898. His work has proven satisfactory. I recommend that he be continued.

Professor Covell's estimate of the additional apparatus necessary for proper instruction in this department accompanies this report.

PHARMACY.

Many of our agricultural colleges give courses in pharmacy. I believe such a course in our college would be well sustained. Dr. Shaw, our professor of chemistry, is of the opinion that a pharmaceutical course would not require an additional outlay of more than $150.00 a year. I respectfully ask the Board to take into consideration the advisability of establishing such a course.

TABULATED STATEMENT OF RECITATIONS, ETC.

You will find appended a tabulated statement of classes and size of classes; also, the number of hours given to each class and the whole number of hours devoted by each instructor to recitations and lectures. An inspection of this table and of the reports rendered by members of the Station Council should give a tolerable correct idea of the work done by every instructor in the college.

Accompanying find a financial report or statement prepared by our clerk, Prof. T. H. Crawford.

Respectfully submitted,

THOS. M. GATCH, President.

OREGON AGRICULTURAL COLLEGE,

CORVALLIS, OREGON.

Report of the President of said institution to the Secretary of the Interior and the Secretary of Agriculture, as required by act of Congress of August 30, 1890, in aid of Colleges of Agriculture and the Mechanic Arts.

I. Condition and Progress of the Institution for the year ended June 30, 1898, especially –

(1) Changes in course or methods of instruction if of sufficient importance to warrant mention, (2) purpose, structural character, and cost of new buildings or additions to buildings, and (3) provision, both didatic and experimental, for the study of electricity and compressed air as secondary motive powers, and of electricity as an element of nature:

II. Receipts for and During the year ended June 30, 1898.

1. Balance on hand July 1, 1897, over and above all indebtedness (excluding funded debt, if any)	$ 2,992.60
2. State aid: (*a*) Income from endowment granted by State	
(*b*) Appropriation for current expenses	
(*c*) Appropriations for building or for other special purposes	5,000.00
3. Federal aid: (*a*) Income from land grant, act of July 2, 1862	12,553.85
(*b*) Additional endowment act of August 30, 1890	23,000.00
(*c*) For experiment stations, act of March 2, 1887	15,000.00
4. Fees and all other sources	1,161.47
Total	$59,707.92

III. Expenditures for and During the year ended June 30, 1898.

1. Instruction in the subjects specified in sec. 1, act of August 30, 1890	$23,229.10
2. Instruction in all other subjects, if any, not mentioned in Question 1 of this series	
3. Administrative expenses (President's, Secretary's, Treasurer's, Librarian's salary, clerical service, fuel, light, etc.)	9,035 71
4. Experiment Station	15,000.00
Total	$47,264.81

IV. Property, Year Ended June 30, 1898.

Value of all buildings, $53,000; of other equipment, $16,500.

Value of above property not used for instruction in the subjects specified in section 1 of act of August 30, 1890, buildings, $23,000; of other equipment, $1,200.

Total number of acres, 198.91; acres under cultivation, 120; acres used for experiments, 25; value of farm lands, $14,500; amount of all endowment funds, none.

Number of bound volumes, June 30, 1898, 3,000; pamphlets, unknown (2,000).

V. Faculty during the year ended June 30, 1898.

	MALE.	FEMALE.
1. College of Agriculture and Mechanic Arts:		
(*a*) Preparatory classes		
(*b*) Collegiate and special classes	20	6
(*c*) Total, counting none twice	20	6
2. Number in all other departments		
3. Number of staff of Experiment Station	7	

VI. Students during the year ended June 30, 1898.

	MALE.	FEMALE.
1. College of Agriculture and Mechanic Arts:		
(*a*) Preparatory classes		
(*b*) Collegiate and special classes	177	144
(*c*) Post Graduate courses	7	8
Total	184	152
2. Number in all other departments		

3. Number of students that pursued courses in agriculture, 61; mechanical engineering, 106; civil engineering, none; electrical engineering, none; mining engineering, none; architecture, none; household economy, 144; veterinary science, none; military tactics, 177.
4. What degrees and how many of each kind were conferred in 1897–1898—
   On men—B. S. in Agric., 6; B. S. in Mechanics, 11.
   On women—B. H. S., 12.
5. What and how many honorary degrees were conferred in 1897–1898, none.

(Signed:) THOS. M. GATCH, President.

By F. BERCHTOLD, Dean.

October 27, 1898.

REPORT OF THE DIRECTOR.

To the Honorable Board of Regents of the Oregon Agricultural College and Experiment Station:

GENTLEMEN: —Early in the year I requested members of our Station staff to prepare detailed statements of the lines of investigation and experiment in which each was engaged. I also requested them to note any new lines which they intended to institute. These statements were placed on file and at our monthly meetings they were read and discussed, every member taking up his own paper, item by item, and reporting progress, describing each step, or giving reasons why no progress had been made. Thus every Station man became interested not only in his own department but in the work of the Station as a whole. Comments were made, views were interchanged and considerable activity in various departments became manifest.

The results of the investigations and experiments by members are embodied in the accompanying reports.

Unusual interest has been taken in the Farmers' Institutes held during the past year in various parts of our state. Trusting that the Honorable Board had shown good judgment in the choice of all members of our staff, I had intended not to make special mention, commendatory or otherwise, of a single member. I cannot refrain, however, from saying that for the success of our institutes we are indebted to the energy and organizing ability of our Professor of Agriculture.

Our winter short course was but a repetition of the failure that has characterized every other attempt made by the college in this direction; I mean as far as attendance is concerned.

The lectures of our professors were interesting and instructive, the new cheese plant was in successful operation, work in the laboratories was in progress, but the people took little interest in all these things. While some days fifteen or twenty would chance in at the lectures, not more than seven were regular attendants. However, the public lectures of the course given by Mr. B. S. Pague, Mr. John Minto, Dr. A. Sharples, and Mr. H. E. Dosch were well attended. We propose to continue our effort to interest the people in our short course, as we believe it can be made a valuable medium for the dissemination of knowledge.

Seven bulletins have been issued by the Station and each of these has gone to over 3,600 addresses. Our bulletins compare favorably with those issued by most stations. Nearly all have received favorable comment in our agricultural and scientific papers, and many letters of commendation have been received by me from the people.

Find statement of accounts accompanying.

Respectfully submitted,

THOS. M. GATCH, Director.

June 29, 1898.

FINANCIAL ACCOUNT.

Oregon Agricultural Experiment Station, in account with United States Appropriation, 1897–1898.

DR.

To receipts from the Treasurer of the United States as per appropriation for fiscal year ending June 30, 1898, as per Act of Congress approved March 2, 1887	$15,000.00

CR.

By Salaries	$10,039.99	
Labor	1,155.90	
Publications	388.47	
Postage and stationery	77.25	
Freight and express	240.02	
Heat, light, and water		
Chemical supplies	372.51	
Seeds, plants, and sundry supplies	487.11	
Fertilizers	20.63	
Feeding stuffs	50.08	
Library	378.75	
Tools, implements, and machinery	95.70	
Furniture and fixtures		
Scientific apparatus	296.87	
Live stock	187.45	
Traveling expenses	471.38	
Contingent expenses	27.35	
Buildings and repairs	710.54	
Total		$15,000.00

SUPPLEMENTARY REPORT.

Local Station Fund.

Balance on hand July 1, 1897	$ 602.50	
Received from sales of farm products, etc	702.75	
		$ 1,305.25
Disbursed for building repairs	67.84	
Balance	1,237.31	
		$ 1,305.25

REPORT OF THE AGRICULTURIST.

President Thos. M. Gatch, Director of Experiment Station:

SIR:—Permit me to hand you a report of station work, in agricultural department, for the year ending June 30, 1898.

The work in the department has been directed along the lines indicated in the outline of work submitted to the Station Council at the beginning of the year.

Two bulletins have been published during the year. One a joint bulletin with the department of chemistry, No. 47, on the feeding of cheat and clover hay. This publication contains the results of experiments carried on with a view of determining the comparative digestibility of these two substances.

The results of the experiment show that the digestion co-efficient (per cent of material digested) was greater in clover than in the cheat. The following table gives the relative per cent of digestible material in the two substances under experiment, as determined by a chemical analysis of the food and of the excreta. The table is compiled from Bulletin No. 47.

	100 lbs. of clover hay contains			100 lbs. of cheat hay contains		
	Composition	Per cent digestible	Pounds digested	Composition	Per cent digestible	Pounds digested
Water	4.27			7.00		
Ash	8.50			9.09		
Fat	3.35	52	1.74	1.95	32	.62
Protein	14.84	63	9.35	6.06	42	2.54
Crude fiber	28.83	59	17.01	31.80	46	14.63
Nitrogen free extract	40.20	71	28.54	44.10	49	21.61
	100.00		56.64	100.00		39.40

Computing the nutritive ratio, (found by multiplying either extract by 2½, adding to the product the crude fibre and nitrogen-free extract, and dividing by the protein. It expresses the relation between the carbohydrates and the protein,) for each, as determined by the experiment, it is found to be:

For clover hay.....1: 5.3
For cheat hay.....1:15.0

The chemical analysis shows that cheat contains a larger per cent of indigestible woody fibre than clover, and less than half as much protein or flesh formers. In carbohydrates, or those substances which go largely to keep up animal heat, the cheat is better

provided than the clover. This to a certain extent explains why the cheat gives such favorable results in keeping stock animals, or those which are being kept over winter. In the fat contained the cheat is not nearly as well provided as the clover.

The nutritive ratio is rather wide, that is, there is a large proportion of carbohydrates to the protein, or flesh forming substance, there being 15 of the former to one of the latter. It is not economical to require the animal functions to take care of so much crude fiber in order to obtain a sufficient supply of nitrogenous material. It is cheaper to supply the deficiency by a better balanced ration. This might be done by feeding liberally with bran, oil meal, pea meal, or cotton seed meal, but in feeding these concentrated foods the expense is materially increased. The best results will be obtained when we feed in the coarse food as nearly a complete, or balanced ration as possible.

This report would tend to prove that cheat hay is not as desirable a coarse food for cattle as clover. For horses, and for stock animals, it might be used where better grasses can not be successfully grown.

Bulletin No. 54, was published in May, 1898, by this department. This publication contains reports on the following subjects: Notes on Flax and Hemp; Dairy Rations; Fresh vs. Stripper-cow Butter; Feeding Pumpkins to Pigs and Feeding Artichokes to Pigs.

The work presented in this bulletin, is the result of work conducted in the department under my direction. Professor Kent was given charge of the testing of rations of dairy animals, and wrote up the results as they appear in the report.

The report on Flax and Hemp tests, is the result of work performed last season in growing these crops. The notes contain a detailed account of conditions of soil and growth, together with notes on the varieties tested. The notes on varieties, and observations on the work, are here presented.

NOTES ON VARIETIES.

Belgian.—First appearance above ground May 17th. Second set of leaves May 25th. Flax began to bloom June 24th, forty-three days from seeding. The flax was at this time 25 to 30 inches high on the clover sod, and 20 to 25 on the potato ground. Flax out of bloom and turning yellow at base of stock July 19th. The flax was ready to pull at this date. This was sixty-eight days from the date of seeding. When compared with the time required for the plants

to reach maturity, in other flax-growing sections, this is a very short time indeed. Mention is made of this in another part of the report.

This variety was very little branched and made an average growth of forty inches. A great many of the plants on clover sod reached fifty inches in height. On the potato ground the flax did not exceed twenty-six or thirty inches, and was not considered worth harvesting.

The flax was pulled July 19th, and the straw tied into bundles six or eight inches in diameter. The bundles were set up in small shocks to dry. The flax remained in the shocks until August 11, when it was weighed, yielding 3751 pounds per acre. A portion of the flax was weighed when pulled July 22d, and again when dry August 11th. The flax shrunk sixty per cent in weight during this time.

The Belgian variety made the best showing, as to yield and quality of straw, so far as could be determined from its appearance.

Pure Riga.— There was very little difference between this variety and the Belgian. The Belgian was more vigorous in its growth, and reached maturity a little earlier. The blooms came out five days earlier on the Belgian than on the Riga. The Riga began to bloom June 29th, forty-eight days from seeding. The flax was ready to pull July 24th, seventy-three days from time of seeding. The Riga was thinner on the ground than the Belgian on account of seed not germinating. This caused the plants to branch more than the Belgian, but not so badly, however, as in the Dutch varieties. The flax was pulled July 24th, and treated the same as the Belgian. It was weighed on August 11th, showing a yield of 2,140 pounds of dry straw per acre. Average length of straw thirty-six inches.

Finest Dutch Sowing. This is a blue blossom Dutch variety resembling the Riga very much. It matured a little earlier than the Riga. It was ready to pull July 22d, seventy-one days from the date of seeding. The straw was the same height as the Riga. There were more lateral branches in this variety, even where it had the same number of plants on the ground as the Riga. This variety yielded 2,080 pounds of dry straw per acre.

White Blossom Dutch. This variety was later in maturing than those named above. It was not ready to pull until August 3d, 83 days from the date of seeding. The straw was coarser than from

any other variety, and was more branched at the base. The average length of the straw was 33 inches. The yield was not as great as in other varieties. As compared with the other kinds grown, it is not a desirable variety. One test is not conclusive however, and should count for what it is worth and no more.

COST OF GROWING AND HARVESTING FLAX.

An accurate account was kept of labor expended in preparing the ground and sowing the seed, and of the time required in harvesting the flax. The following summaries are given. The relative cost of growing flax on a large scale would be somewhat less:

Plowing, harrowing and sowing seed, $7.70 per acre. Wages of man and team reckoned at $2.50 per day. Pulling flax and tying in bundles, with two bands made of binder twine, $5.70 per acre. Weeding plants by hand, $1.75 per acre. This represents cost of labor only, and does not include interest on investment in tools, rent of land, etc.

OBSERVATIONS.

While we could hardly expect conclusive results from a single year's experience, and especially without a further test of the value of the fiber produced, yet, so far as growth and quality are concerned, indicated by the appearance of the straw, the results were very flattering indeed. The yield was not much more than half a crop, owing to thin seeding, due to a lack of moisture in germinating the seed when first sown. In this particular the conditions were quite unfavorable.

The climate and soil seem to be well adapted to growing flax as shown on the rapid development of the plants. The period of growth was not as long as that in many flax-growing sections, as the following would indicate:

Mr. Eugene Bosse says, in a report to the Department of Agriculture, regarding the growth of flax for fiber in Minnesota and Wisconsin, that "the flax in this part of the west should be ready to pull in from eighty-five to ninety-two days after sowing when sown from the 1st to the 15th of May; but the capsules must be turned yellow, and the lower half of the plant free from leaves. The richer the land the earlier the flax may be sown, and the earlier the flax is sown the more seed it will take to have a good stand."

None of the varieties tested required the maximum time indicated here, and only one passed the minimum. The white blossomed Dutch required eighty-three days.

The straw produced by the Belgian and pure Riga varieties was of uniform length and quality. It was pronounced excellent by parties who were familiar with the growth of flax in this country and in the countries of Europe.

The weather conditions were not as favorable for a large growth of flax as we might well expect in this locality.

The lack of moisture during the early growth of the plants, hindered very materially in the greatest development. There was only .19 of an inch of rain fell from time of seeding, May 12th to June 19th. Flax should make its greatest growth in the first forty days, but in this case the growth was hindered just at the critical time. This long continued drought would have proved fatal to the young plants in a less humid atmosphere.

The total precipitation at the college during the growth of the flax is shown in the following table, taken from the state weather bureau report:

	May	June									July			Total
Date	16	13	14	19	20	21	22	25	26	29	30	1	5	7	Inches
Precipitation	.16	.01	.02	.23	.15	.75	.39	.03	.01	.02	.48	.02	.06	.01	2.34

The flax on clover sod did much better than that after potatoes. In fact the flax grown on the potato ground was not considered worth pulling.

The experiments with flax and other fiber plants are again in progress this season, and will furnish material for a more conclusive report in which we shall endeavor to give the final results of a test of the fiber produced. So far the experiments indicate favorable soil and climatic conditions for the productions of high grade flax fiber. If we can produce the raw material, economically, and of a high quality, we shall have added another important industry to our agricultural resources.

The manufacturer is ready to take all the fiber we produce, providing it is of high quality, and furnished in sufficient quantities to call the trade in this direction.

Three illustrations accompany the report. One of flax showing bundle, as tied in field, with good and bad straw; and one showing retting pond located at Salem, Oregon.

The report on hemp is a preliminary one stating the results of last year's planting. The results were quite satisfactory so far as growth is concerned. No attempt was made to prepare the fiber or to test its quality for manufacturing purposes.

Experiments with both hemp and flax are in progress again this year.

The following is a brief summary and chief points in the experiments with dairy rations, as written up by Prof. F. L. Kent, instructor in dairying.

"What is the best feed for a dairy cow," is a question asked nearly every time the matter of feeding is brought up at a farmers' institute. The "best feed" referred to would be that ration which would produce milk, or, more properly, butter fat, at the least cost. In order to determine what would be the most economical ration, made up of the various products of Oregon farms, the station arranged a series of five rations which were fed to a portion of the station herd during the winter of 1896 7, beginning in December, '96, and continuing into March, '97. Four cows which were giving about the same quantity of milk each, and which had about the same capacity for consuming food, were selected for the purpose. The cows had been in milk from two to three months, and had all been bred again before the experimental feeding began.

Ration I consisted of corn silage, 25 pounds, clover hay, 10 pounds, bran, 6 pounds.

Ration II consisted of corn silage, 25 pounds, clover hay, 10 pounds, bran, 5 pounds, oat chop, 3 pounds.

Ration III consisted of corn silage, 40 pounds, clover hay, 5 pounds.

Ration IV consisted of clover hay, 15 pounds, bran, 5 pounds, oat chop, 2 pounds, carrots, 8 pounds.

Ration V consisted of clover hay, 15 pounds, bran, 5 pounds, oat chop, 3 pounds, shorts, 2 pounds.

The corn silage was prepared from Pride of the North corn, which yielded about ten tons to the acre of green fodder.

The corn was properly matured for silage, and fed to the cows in first class condition.

The clover hay came from a field of twenty eight acres which produced ninety six tons of well cured hay.

In making the computations, the following values were allowed for the different feeding stuffs: Clover hay, $6.00 per ton; bran, $10.00 per ton; corn silage, $1.50 per ton; oat chop, $18.00 per ton; carrots, $2.00 per ton; shorts, $16.00 per ton.

In all the rations except number III the silage was all fed at noon, and the grain and hay equally divided between night and morning feeds. In number III twenty pounds of silage were fed at noon and the remainder was fed with the hay night and morning.

The results show that the cost of producing a pound of butter fat was as low as 6.3 cents with the cow Rose in feeding ration III, while with the same cow in ration V the cost reached the sum of 14.6 cents per pound of butter fat. Taking the average of the four cows we find that butter fat was produced at a cost of 7.0 cents per pound when feeding ration III, and at a cost of 11.4 cents when ration V was fed. But this would hardly justify the statement that ration III was a better one than ration V, for in feeding the former the four cows showed a loss in live weight amounting to an average of 36 pounds each during the fifteen days, and in feeding the latter ration the cows made an average gain of 21 pounds each in the same length of time.

It is desirable that a cow remain fairly stationary in weight during the milk-giving period, hence the use of a ration like No. III is not desirable. Ration V, in addition to its high cost, has the disadvantage of causing the cows to lay on flesh too rapidly, but it is possible that this gain would not have been so rapid had there not been so great a loss in weight during the feeding of ration III.

Of the five rations fed, No. I, consisting of 25 pounds corn silage, 10 pounds clover hay, and 6 pounds of bran is shown by the tables to be the most satisfactory. The cost of a pound of butter fat is low, only 10.2 cents, at a time when butter was worth 25 cents per pound in the market. During the fifteen days the four cows gained in weight a total of only five pounds, or about one pound each on an average.

Rations IV and V were arranged without corn silage as already shown, and the results are apparant from the tables. In rations I and II, where the silage was fed in connection with the grain and hay, butter fat was produced at a cost of 10.4 cents and 12.8 cents respectively. In rations IV and V, where the silage was omitted and larger quantities of hay and grain fed, the cost per pound of butter fat was 16.1 and 17 cents respectively.

The term butter fat is used because the butter fat can be determined with ease and exactness, and shows just what the cow is doing, while the amount of butter made from a given quantity of milk depends somewhat upon the operator. If a separator is used to do the skimming and care is exercised in the churning there should be an increase in the amount of butter made over the quantity of fat contained in the milk, amounting to not less than one-eighth of the number of pounds of butter fat. That is, if 100 pounds of fat are present in a given quantity of milk, there ought to be produced from it at least 112½ pounds of butter. Not frequently in cream series, the amount is as high as 115 to 118 pounds. Figuring on the basis of one-eighth increase, we find that a pound of butter could have been produced with these rations, taking into consideration the cost of feed only, at the following rates:

Ration I, 9.2 cents; ration II, 11.4 cents; ration III, 6.2 cents; ration IV 14.3 cents; ration V, 15.4 cents.

It is interesting in this connection to notice the cost of production of a pound of butter fat in other states.

The Minnesota Experiment Station, Bulletin 35 has a year's record of cost of butter fat production from which we take the following:

"The ration fed during the winter consisted of 24 to 40 pounds silage, 3 to 5 pounds mixed hay, 6 to 10 pounds wheat bran, and 1 to 2 pounds linseed meal. Ten cows calved between October 16 and November 30, 1892, produced butter fat during the first three months of the succeeding year at the following average cost per pound: January, 11.6 cents; February, 12.9 cents; March, 15.4 cents."

From Bulletin 52 of the Cornell University Experiment Station, New York, which reports results of a whole year's work in feeding, we take the following:

"The ration fed during the winter consisted of 40 to 55 pounds silage, 10 to 15 pounds hay, 10 pounds roots, and 8 pounds grain. Twelve cows which calved between September 1 and November 6 produced butter fat during the first three months of the succeeding year at the following average cost per pound: January, 20.7 cents; February, 21.8 cents; March, 22.1 cents."

ROOT FEEDING.

F. L. KENT.

During the winter of 1897–8 some feeding was done for the purpose of studying the effect of a considerable quantity of various roots in a ration. Three kinds of roots were used, viz: Sugar beets, carrots, and mangels. Three rations were made up as follows:

Ration I, sugar beet ration: 8 pounds clover hay, 20 pounds corn silage, 3 pounds wheat and oat chop, 3 pounds bran, 23 pounds sugar beets.

Ration II, carrot ration: 8 pounds clover hay, 20 pounds corn silage, 3 pounds wheat and oat chop, 3 pounds bran, 24 pounds carrots.

Ration III mangel ration: 8 pounds clover hay, 20 pounds corn silage, 3 pounds wheat and oat chop, 3 pounds bran, 24 pounds mangels.

The above rations were fed to three of the four cows in the experiment. The fourth cow, Corvallis Beauty, was fed the same ration except that she consumed about one pound less of hay per day. With the exception of the cow just mentioned the animals fed were the same ones used in the feeding of the previous winter.

Each ration was fed for a period of four weeks, one week preliminary and three weeks' test. During the last week of each feeding period the cream from two days' milk was churned and the quality of the butter noted.

Owing to the price of wheat being higher than during the preceding winter the values allowed the grain portion of the ration are somewhat higher than in the previous table of feed values. Following are the feeds used and the value allowed per ton: Clover hay, $6.00 per ton; wheat and oat chop $20.00 per ton; corn silage, $1.50 per ton; bran, $11.00 per ton; beets, carrots, and mangels, $2.00 per ton.

The hay and silage were practically the same as used the preceding winter. The wheat and oat chop consisted of about equal parts of wheat and oats which had been grown mixed.

The value placed upon the mixture was based upon the market price of the two grains at the time of feeding plus the cost of chopping.

The rations were fed in three feeds, the silage being fed at noon, and the hay, grain and roots equally divided between the morning and evening feeds.

Computing the cost of producing a pound of butter on the same basis as used with the previous set of rations we find that butter

could have been produced at a cost for feed only at the following rates: With sugar beets, 13.4 cents per pound; with carrots, 13.2 cents per pound; with mangels, 13.5 cents per pound.

Very little difference was noticeable in the quality of butter from the different rations, especially between the rations consisting largely of carrots and sugar beets. That from the ration made up largely of mangels was not quite so high in flavor however as the butter from the other two rations. Flavor was the only point on which the butter was judged, the usual scale of forty five as perfection being taken as a basis. Following is the score on flavor; carrots, 43; sugar beets, 43; mangels, 42.

STRIPPER COW VERSUS FRESH COW BUTTER.

A brief report is made on an experiment in testing the butter product from fresh cows as compared with that made from cows further along in the period of lactation.

The conclusions drawn by Mr. Kent in his report are as follows: So far as this short experiment goes it shows that the milk from comparatively fresh cows gives up its cream more readily even with a separator, than does milk from cows well along in the period of lactation.

It also shows that butter made from the milk of cows which have been in milk for a considerable period of time is slightly inferior to that made from the milk of cows which are comparatively fresh.

PIG FEEDING EXPERIMENTS.

In feeding pumpkins to pigs the following summary of results is given.

TABLE V.—BULLETIN NO. 54.

	Total Weight Oct. 30	Total Weight Nov. 13	Total Weight Nov. 27	Total Weight Dec. 11	Total Weight Dec. 25	Total gain
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Weight by periods	1029	1107	1237	1378	1528	499
Total pumpkins consumed		1210	1975	2170	2170	7523
Total shorts consumed		168	168	252	336	924
Average cost per lb. gain		*2.9 cents.				

* Pumpkins reckoned at $2.50 per ton. Shorts reckoned at $12.00 per ton.

RESULTS.

Reckoning the pumpkins at $2.50 per ton, and the shorts at $12.00, the cost would be as follows: Pumpkins, $9.40; shorts, $5.54, or a total cost of $14.94.

The total gain in live weight during the entire period was 499 pounds. This makes the cost of food for one hundred pounds gain, live weight, $2.00. This is much cheaper than pork can be produced from grain rations, when reckoned at present prices.

The profit of feeding pigs is not wholly governed by the cost per pound of gain made during the fattening period. The growth up to this time may have been made at a much less cost, but is not marketable. Hence a little more can be profitably expended during the finishing period, and yet not represent a net loss.

On the whole the results were quite satisfactory when compared with the previous work in feeding grain rations alone. The pigs seemed to relish the food and were very contented. It was somewhat surprising that such a large amount of pumpkins could be consumed by each pig. During the last two periods, the pigs consumed an average of 26 pounds of pumpkins a piece each day. At first it required only a small ration of shorts to satisfy the pigs; but toward the end of the feeding period the shorts had to be increased. The effort was made to induce the pigs to eat as large an amount of pumpkins as possible, and then make up with shorts the complete ration, or one that would satisfy the needs of the pigs.

The average daily gain during the whole period, from October 30th to December 25th, was one and one-half pounds. The largest daily gain, during any one period, was from December 11th to December 25th, when the pigs gained 1.78 pounds. The daily gain compares favorably with that made from grain rations.

The variety of pumpkins used in the feeding experiment is known and sold as the common yellow field pumpkin.

The meat product from these pigs was pronounced by experienced butchers the best they ever saw. The bacon was not over fat and was firm in texture. The pigs were healthy throughout the experiment. They were not *off* their feed at any time during the feeding period.

While the food does not have everything to do with the quality of the product, yet much of the superior flavor and texture of the bacon and hams produced in Oregon, is due to the feed. There is a broad field for the farmers of Oregon to occupy in producing a superior article of bacon and other pork products. Our climate and feed conditions are the very best that can be found for producing a grade of pork which cannot be excelled in the world. There is not a day in the year, in western Oregon, when pigs cannot have some

form of green and succulent feed. Pastures of clover, grasses and annual plants can be provided that will produce a large amount of food, which, supplemented with a small grain ration, will produce a superior article of meat product. The foreign, as well as the domestic market, demands a better pork product, especially in the hams and bacon. These demands can be supplied on the farms of Oregon, if enough forethought is put into the work to insure a good supply of food. Good blood in the herd, is the first essential, and then a proper food supply, and the results will be wholly satisfactory. Clover, vetch, peas, rape, cabbage, artichokes, pumpkins, grasses, and many of the grains, such as rye and wheat, furnish good pasture for pigs. When we add to these the vast stubble fields, and a ration of shorts, chopped oats and barley, to finish the product, and we have an array of food material which cannot be excelled in any state or country.

FEEDING ARTICHOKES TO PIGS.

In answer to numerous inquiries coming to the station, regarding the use of artichokes for pigs, experiments along this line were carried out. The results reached are here given. The pigs were weighed every fourteen days, and the results are here given in tabular form.

TABLE SHOWING WEIGHT OF PIGS BY PERIODS AND TOTAL GAIN.

EAR TAG.	Weight Oct. 22. lbs.	Weight Oct. 30. lbs.	Weight Nov. 13. lbs.	Weight Nov. 27. lbs.	Weight Dec. 11. lbs.	Total gain. lbs.
No. ear tag 28	133	137	148	165	172	39
No. ear tag 29	119	121	134	146	155	36
No. ear tag 30	117	119	123	129	139	22
No. ear tag 31	192	205	214	231	233	41
No. ear tag 32	200	209	219	238	248	48
No. ear tag 33	215	224	235	255	273	58
Total weight and gain	976	1015	1073	1164	1220	244

The total gain is 244 pounds, or an average daily gain of .81 pounds each pig. This would not be large for pigs fed on grain ration exclusively; but for stock hogs the increase is very good indeed.

The pigs consumed 756 pounds of grain during the whole period. This 3.1 pounds of grain for each pound of gain of live weight. In other experiments, we have found that it takes about 5 pounds of mixed grain to produce a pound of gain in live weight, hence, on this basis, the artichokes consumed would represent two pounds of grain in producing each pound of gain.

The pigs consumed the artichokes grown on one-eighth of an acre. Only a few roots were left in the ground when the feeding ceased. The pigs were healthy and vigorous during the feeding period.

It does not cost much to raise a small area of artichokes, and there is little danger of the farmer having too great a variety for his stock. A small acreage might be profitably employed by any farmer, who expects to make his own bacon, or supply the market with a superior grade of pork products.

Artichokes do best in rich, loose soil, where there is an abundance of humus and decaying vegetable matter.

WORK NOT YET PUBLISHED.

In addition to the work reported in Bulletin No. 54, an experiment was conducted to determine the loss sustained in exposing manures in an open yard, as compared with that for keeping manures protected from the rain. The results of this work will be published in bulletin form during the coming year. The data was obtained too late for publication this year.

EXPERIMENTS IN GRASSES AND FORAGE PLANTS.

Last season nearly 200 varieties of grasses and forage plants were put out in small plats to test their adaptability to the climate and soil. The seed in some plats failed to germinate, and in some others only a few plants were obtained. On the other hand many very good seedings were obtained, and the plants make a very fine showing indeed.

This work we consider very important. There was never a time in the history of the state when there was such universal interest in the improvement of the forage plants. The native varieties are fast disappearing and their places must be filled with other domesticated plants.

The work requires a great amount of care and attention, and will require considerable time before definite results can be reached. A partial report, setting forth the probable value of several varieties, which are entirely new to this section, can be prepared during the coming year.

I am making an effort to collect many of our native plants, such as grasses, clovers and vetches, for experimental purposes. The Department of Agriculture has furnished us with the seeds of many new plants gathered in foreign countries. These are now growing in plats on the farm.

ANNUAL FORAGE PLANTS.

Among the annual forage plants, grown last season, and not reported upon elsewhere, are the following:

Dhoura, Yellow Milo Maize, Jerusalem Corn, Black Rice Corn, three varieties of Kaffir Corn, Brazilian flour Corn, Early Fortune Millet, Canary Grass, Cow Pea, Teosinte, Bean and Idaho Coffee pea.

There is little to be said in favor of these plants for this locality.

The Early Fortune Millet is the most promising of any in the list. It produces a large amount of seed and is highly recommended for hog feed. This plant is being grown again this season; and the seed has been distributed for trial in other parts of the state.

After several years' trial we are of the opinion that the other plants named in the list are not well adapted to practical use in western Oregon.

In a warm, sandy, soil, some of these might prove of considerable value. In fact the Kaffir Corn and Dhoura, have been grown successfully in some parts of the state.

There is such a wide variation in the growth of these plants, under varying conditions, that what is true of a certain locality will not apply to other sections. The conditions of soil and local climatic conditions have much to do in the success of any of these annual plants.

All plants adapted to a warm, dry, open soil, grow very slowly here until late in the season. The maximum temperature of the soil is not reached in this section until late in the fall; consequently all plants requiring this high temperature will not mature early enough to become of great value. Only the earliest varieties of corn will reach maturity, with any degree of certainty, in this climate.

EXPERIMENTS WITH WHEAT.

We are testing, in co-operation with the Department of Agriculture at Washington, D. C., several varieties of imported wheat. Ten samples coming from Russia, Greece, India, Spain, Italy and France were put out last fall.

We are also growing several new varieties obtained in the Eastern States. These plats are in very good condition and notes are being taken as the season progresses.

INSTITUTE WORK.

As chairman of the farmers' institute committee, I have organized and attended the following institutes since my last report, June 30, 1897: At Siuslaw, Halsey, Junction City, Howell, Tigardville, Gresham, Rowland, La Grande, Baker City, Arlington, The Dalles, Hood River, Monroe and Scappoose. I presided at each of these meetings, and took part in the programme with some topic related to practical farm operations.

Other institutes were held at Tangent, and Springfield; but owing to an invitation to attend the Washington State Dairy Association at Seattle, I could not be present at these meetings.

The institutes were well attended and in many respects were the most successful meetings ever held in the state.

The institute work is growing in importance and interest among the farmers of the state; and the time has come when the work should be placed on a firmer foundation.

Through the institutes, the college and the station work is carried direct to the people, and made to apply more directly to their needs than in any other way. In this way the people get better acquainted with the college and its work, and at the same time get the benefit of the results reached in station work. The information imparted in institutes does much more good than that sent out in bulletin form. The facts become more specific in their application.

The needs of local conditions are better met by institute work.

The institute work, during the past year, has occasioned more favorable comments from the press than ever before. This would indicate that public sentiment is tending toward this method of imparting information to the industrial classes. In other states institute work is recognized as a legitimate and important phase of college and station duties.

New York State has gone farther than any other state in this work. Under the direction of the station they have established what is known as *extension work* in addition to the institute work.

The extension work is intended to further the interests along experimental and educational lines.

The following extract from an act of their legislature will give a very clear idea of the work undertaken.

Chapter 128 of the Laws of 1897 provides for carrying work throughout the entire state as follows:

"In giving instruction by means of schools, lectures and other university extension methods, or otherwise, and in conducting investigations and experiments; in discovering the diseases of plants and remedies therefor; in ascertaining the best methods of fertilization of fields, gardens and plantations; and best modes of tillage and farm management and improvement of live stock; and in printing leaflets and disseminating agricultural knowledge by means of lectures or otherwise; and in preparing and printing for free distribution the results of such investigations and experiments, and for republishing such bulletins as may be useful in the furtherance of this work; and such other information as may be deemed desirable and profitable in promoting the agricultural interests of the state."

While we cannot hope to go as far as New York State in this work, we sincerely believe the time has come when state aid should be extended to institute work in Oregon. An appropriation of not less than $1,500.00 per year should be made to carry forward the institute work. This amount should be required outside of the salary of the superintendent of institutes, who should be a member of the college faculty. This is the plan followed by several states, and is the most economical method in practice. The station workers have no time to organize the institutes; but could afford valuable assistance in carrying out the programs. More expert instruction is necessary in order to make the institute work as valuable as it ought to be.

OTHER MEETINGS ATTENDED.

In addition to the regular institute work I was present and took part in the programs presented at the Pacific Northwest Cattle Growers' Association held at Pendelton, February 15th, 16th and 17th; at the Pacific Northwest Wool Growers' Association held at The Dalles, March 1st, 2d and 3d; and at the Dairy and Hog Convention held at Walla Walla, Washington, March 15th, 16th and 17th. Mr. Kent was also present and took part in the program at the dairy convention.

These conventions were the first of the kind ever held in the northwest. They were largely attended, and permanent organizations were established, including the states of Idaho, Montana, Washington and Oregon.

Mr. Kent and myself were present from this department at the Oregon State Dairy Association, which met in Albany the first week in April. This was a very successful meeting, and there was a cordial feeling throughout the sessions toward those who attended

from the college, and assisted in making the association one of the most successful ever held.

Steps should be taken to have the next annual meeting held at Corvallis, and thus bring a good many dairymen into closer relationship with the college and its work.

SHORT COURSE.

The "Short Course," in Dairying and Horticulture, was not as largely attended last winter as it should have been. The interest was good, and the work reaches a few worthy and appreciative people.

This work needs to be pushed with greater vigor in the way of advertising the course. Very few people in the state know what is meant when they read of a "short course," at the Agricultural College. During this course, which extended from January 11th to February 10th, I delivered a lecture each day to those who were in attendance. Professor Kent spent two hours each day in giving practical dairy instructions. The work this year included cheese-making, as well as butter-making.

Fifty-nine Young America cheeses were made by the class and in this way much technical information was obtained.

FUTURE WORK.

1. Further experiments in testing dairy rations.
2. Experiments in storing butter in cans.
3. Testing fiber plants.
   (a) Flax.
   (b) Hemp.
   (c) Abutilon.
   (d) Jute.
   (e) Ramie.
4. Testing imported varieties of wheat.
5. Noting the physical and chemical changes in adobe land after being tile drained.
6. Field experiments in testing new varieties of plants.
7. Grasses and forage plant experiments.

In addition to the above work we would repeat what was said in our last report regarding the sheep and poultry industries. Experiments in both of these industries would touch important and unexplored fields in our own state. Too much cannot be said of

the importance of these two agricultural industries. There are many problems connected with the feeding and breeding of sheep in this state, the solution of which would be of very great interest and value.

The matter of feeding sheep for market has been little thought of in Oregon. Many valuable sheep foods have never been tested in this state; and we would like very much to enter upon this line of work. To do this would entail an expenditure of funds for animals and for fixtures to care for them properly.

What has been said of sheep will apply with equal force to the poultry industry. Many stations are taking up this line of work, and it should be our province to undertake the same as soon as suitable appliances can be obtained.

IMPROVEMENTS MADE.

During the past year some 2,600 feet of seven inch tile have been laid to take the place of a smaller tile, which proved inadequate to carry the water from our neighbors' land and from the college farm. The seven inch tile proves very satisfactory. The four inch tiles removed were laid in an adjoining field, making nearly one mile of tile drain laid during the year.

There are only four or five acres of land on the farm at present, where water stands for any length of time during the rainy season.

Some of the drained land is the most productive land on the farm.

One hundred and twenty rods of line fence have been renewed during the year with a board and wire fence.

Improvements have been made in the stables by building open partitions in front of the animals.

Professor Skelton has made an accurate survey of the fields of the farm, which it is our purpose to plat, in a permanent record and history of the farm. This is work which will prove of great value in the future, and is recommended by all the leading agriculturists, in the various colleges and stations.

STOCK.

The stock on the farm at present consists of the following:

CATTLE.

Pure bred Jerseys (cows and calves)	13
Pure bred Ayrshires	2
Pure bred Holstein	1
Pure bred Jersey bulls	2
Grade Jersey cows and calves	14
Total	32

PIGS.

Berkshire boar	1
Berkshire sow	1
Berkshire pigs	12
Total	14

HORSES.

Farm horses	5

IMPROVEMENTS NEEDED.

Among the most imperative needs in the department are the following: A new boiler to supply steam for the engine built in the mechanical department for use on the farm.

At the beginning of the year, it was thought best by President Gatch, Professor Covell and myself, to undertake to build an engine for use in running the feed cutter and chopper. The rough castings for a nine-horse power engine were procured and have been fitted up by the students in the mechanical department during the past year. It is our plan to have the engine and boiler mounted on a portable platform, so that it can be easily moved with a pair of horses. It will require about two hundred dollars to furnish a boiler and mount the engine as we have outlined. This work should be done before September 20th, as we have no suitable power to run the ensilage cutter. The tread power, which has been in use eight years, is nearly worn out, and will not be in suitable condition to use this year.

An addition to the barn should be made to protect the manure heap and furnish shelter for stock during the rainy season. Only temporary sheds are now provided, and these are in very bad repair. Such an addition as will meet the requirements can be built for six or seven hundred dollars.

Last season over eighty tons of manure were hauled away from the barn to the farm fields. This constitutes a revenue which is well worth considering in building up the fertility of the soil. The proper care of barnyard manure is a good object lesson to the boys who will go back to the farms of Oregon.

Among building improvements there is one which is needed very much, and that is a farm house located near the other farm buildings. As arranged at present there is no one living near the farm barns, except those who live at Cauthorn hall; and the arrangements for board there are not very satisfactory. Their hours for meals conflict very seriously with the overseeing or performance of work on the farm. During vacation this arrangement is broken up, and there is no one near enough to render assistance in case of fire, or to look after the stock which is kept on the farm.

Those who do chores are compelled to live in the city, and much time is required in coming to and from their work.

These facts are stated for the purpose of calling attention to the conditions which should be carefully considered in planning for the future usefulness and development of the institution.

The work in this department cannot reach the degree of proficiency that it should, until suitable laboratories are provided for experimental and practical demonstrations.

A majority of the agricultural colleges at the present time are provided with suitable classrooms and laboratories where illustrative work can be carried on. A lecture room should be arranged so that animals or farm machinery could be brought before the class. Laboratories for physical examination of soils are very important. Such an equipment may be beyond the present resources of the institution; but they should not be lost sight of in planning for the future. The National Association of Agricultural Colleges has stated in very strong terms that such an equipment is essential in teaching the science of agriculture.

WAGES OF EMPLOYES.

The wages of labor employed by the day during the past year has been $1.00, but I think it will not be easy to procure efficient help for this price during the coming year. I should like to be permitted to pay $1.25 per day during the summer and $1.00 at other times.

The hands who work during the summer vacation should, in my opinion, be paid $35.00 per month. Their work will involve care of

stock and milking on Sunday, which is more than day labor is expected to do.

ESTIMATES FOR THE COMING YEAR—STATION.

Experiments in grasses and forage plants	$ 50.00
Experiments in dairy	50.00
Hand implements	25.00
Set of soil thermometers	30.00
Improvements in building	650.00
Sundry supplies	100.00
Labor	800.00
Five tons bran for stock feeding	55.00
Three tons shorts for stock feeding	35.00
Salaries—French, $900; Kent, $200; Foreman, $540; Conner, $230	1,870.00
Total	$3,665.00

COLLEGE.

Fencing	$ 50.00
Boiler for farm engine	200.00
Five tons bran	55.00
Two tons shorts	22.00
Sundry supplies	50.00
Labor	500.00
Salaries—French, $600; Kent, $800; Conner, $320	1,620.00
Total	$2,497.00

CASH RECEIVED FROM SALE OF FARM AND DAIRY PRODUCTS.

FARM.

Cash paid to Mr. Condon, Clerk	$ 141.44
Cash paid to Mr. Crawford, Clerk	397.51

DAIRY.

Cash paid to Mr. Condon, Clerk	46.40
Cash paid to Mr. Crawford, Clerk	515.02
Total	$1,100.37

REPORT OF DAIRY.

Milk from college herd	60,853 lbs.
Milk purchased for use in dairy	9,412 lbs.
Butter manufactured	2,574 lbs.
Cheese manufactured	927 lbs.

Finally, Mr. Director, I wish to acknowledge my appreciation of the hearty support which you have extended to the department in furthering its usefulness and efficiency. H. T. FRENCH.

REPORT OF THE CHEMIST.

Dr. Thos. M. Gatch, Director of Oregon Experiment Station:

Dear Sir:—I have the honor to submit the following report of work done in the chemical department of the Experiment Station since the date of my last report. The work of this department has been conducted on the same general plan as that of former years and is classified at present under the (1) Soils, (2) Fertilizers, (3) Fruits, (4) Sugar Beets, (5) Cattle Foods and their Digestibility, (6) Miscellaneous. Each of these lines has received as much attention as was at our disposal.

By permission of the Board I spent some weeks at the close of last year and the first part of this year in the East. This time was very profitably occupied in studying methods of station work at a number of the more prominent stations, and in studying newer methods and apparatus at the Massachusetts Institute of Technology, at Boston, where are located some of the most extensive and most thoroughly equipped laboratories and libraries of this country. I feel that I was much benefited by the trip and have been able to do better work for the institution.

At the stations and colleges visited I found a hearty reception, and during the short stop at the various institutions I gained all ideas as to methods of conducting the work etc., that I could. I found that in those institutions from which such a large volume of station work is turned out that neither the head of the department nor his station assistants have class work to do, or if any is done it is limited to one or two lectures per week. I found that in most cases the head of the department did very little routine work of analysis personally. His time was occupied in collecting and digesting the results of analyses made under his direction and in attending to the large volume of correspondence. The routine work of analysis was done by the regular station assistants and by students who were taking advanced work and had reached such a stage that it was safe to intrust them with such work. The principle of division of labor was applied as far as possible each assistant having a particular duty to perform the results being turned into the head of the department to be collected and digested together with

the results from other assistants. With this large number of subordinates a wide division of labor is possible and a vast amount of work becomes possible. Other than this I found that the methods of conducting the work did not differ essentially from that in vogue in this department. With the smaller working force here and the considerable class work required, this thorough division of labor cannot be as thoroughly applied here. When the amount of class work required here and the size of the working force is considered I was gratified to learn that we were not at all behind other institutions of similar character either in amount or quality of work.

During the year past I have had as assistants Mr. J. F. Fulton, B. S., and Mr. F. E. Edwards, B. M. E. By far the larger part of these gentlemen's time has been devoted to college work and their labor in the station has been limited. During May and June Mr. Fulton, by permission of the Board, upon my recommendation, has been on leave of absence for a brief period of study in the east. Isolated as we are from the great centers of learning and contact with others engaged in the same line of work, and not having access to the large libraries to be found in the east, I believe that these visits to the east and other older and larger institutions, even though they be brief, give a wonderful stimulus to work, and are great powers for good in the institution, and particularly is this true of alumni here engaged in work who have not had the advantages of study in some other institution.

Within the limits of this report it will be impossible to discuss to any extent the application of the results obtained in the analyses here given. Suffice it to say that with the exception of some minor analyses, merely mentioned in these pages, the analyses here given fit into a preconceived plan of work and will all be discussed at length in bulletin form at the proper time, and as rapidly as the facilities for publication will permit.

SOILS.

As outlined to you earlier in the season the general plan of work under this head is (1) to acquire as much information as possible relative to the chemical characteristics of typical soil areas of Oregon; (2) to acquire as much information as possible relative to the physical nature of these soils with particular reference to their moisture conditions.

Since the publication of preliminary results under this head in Bulletin 21, October, 1892, the work has progressed more or less rapidly as other lines of investigation more urgent in their demand, would permit. The results obtained within this period have revealed some facts of importance. Particularly is this true concerning the lime supply of Oregon soils. Just at the time of filing the last year's report results had been obtained which indicated that the lime supply of the Willamette valley soils was largely in the zeolitic form of a silicate--probably a double silicate—instead of in the usual form of a carbonate, and consequently is not likely to be of as much value to agriculture as if in the latter form.

In that report reference was made to this fact, and it was further stated that this being true, upon further investigation we might find that many of the valley soils, even though well drained, are actually acid (sour) soils and need applications of lime to produce the best results. To carry this investigation further during the present year, not only have the zeolitic formations been examined further but many soils have been examined as to their acidity. The results of this examination are expressed below. The soils used for this purpose were selected from the large collection of soils which the department has gathered from all parts of the state representing all the more important classes. These results confirm the indications previously obtained, for it will be noted that about 60 per cent of the cases examined gave a distinctly acid reaction, while many of the others gave a trace of acidity. Attention is particularly called to the fact that every sample of the red hill land was acid. This is indeed what might be expected if the lime carbonate is limited in quantity, for the tendency of this compound is to accumulate in the bottom lands at the expense of the hill lands and in subsoils at the expense of soils particularly where rains are heavy as in the case of western Oregon.

TABLE SHOWING ACIDITY OF SOILS.

Lab. No.	Locality.		Character.	Color.	Reaction.
	Postoffice.	County.			
1 F	Gales Creek	Washington	Hill	Red	Slightly acid.
2 N	Buxton	Washington	Hill		Slightly acid.
2 S	Salem	Marion	Bottom		Slightly acid.
615	Grants Pass	Josephine	Hill		Acid.
615½	Grants Pass	Josephine	Hill, (subsoil)		Acid.
618	Wilbur	Douglas	Hill	Red	Acid.
619	Salem	Marion	Hill	Red	Acid.
619½	Salem	Marion	Hill, (subsoil)	Red	Acid.
627	Hubbard	Marion	Bottom	Reddish	Acid.
628	Salem	Marion	Hill	Red	Acid.
628½	Salem	Marion	Hill, (subsoil)	Red	Acid.
629	Portland	Multnomah	Hill	Red	Acid.
763	Hood River	Wasco	Hill	Red	Slightly acid.
764	Hood River	Wasco	Hill	Red	Acid.
765	Marshfield	Coos	Upland	Red	Acid.
766	Marshfield	Coos	Slough	Red	Acid.
612	Central Point	Jackson	Bottom	Dark	No change.
616	Grants Pass	Josephine	Bottom	Dark	Very slightly acid
622	Brooks	Marion	Granite	Light	No change.
623	Buxton	Washington	Bottom	Dark	No change.
624	Buxton	Washington	Bottom	Dark	Acid.
626	Hubbard	Marion	Bottom	Grey	Slightly acid.
643	Halsey	Linn	Bottom	Dark	Acid.
644	The Dalles	Wasco	Silt	Light	No change.
762	Hood River	Wasco	Clay loam	Grey	Slightly acid.
767			Hill	Red	Acid.
768	McMinnville	Yamhill	Bottom	Grey	Acid.
769	McMinnville	Yamhill	Bottom	Grey	Acid.
410	Corvallis	Benton	Bottom	White	Acid.
454	Lewellyn	Lane	Bottom	Black	Acid.
621	Grants Pass	Josephine	Bottom	Grey	Acid.
617	Grants Pass	Josephine	Bottom	Light	Very slightly acid
620			Hill	Red	Acid.
817			Bottom	Dark	Acid.

In accordance with a resolution of the Board, specially directing further investigations along this line, the department has arranged to conduct field experiments in conjunction with the horticultural department as to the effects of lime when used alone and with other chemicals on the ordinary gray loam. Two permanent tracts of land consisting of seven plats each have been laid out. These plats have been treated exactly alike, except so far as the chemicals applied are concerned. The size of the plats is 93⅓ feet long by 46⅔ feet wide. They have been treated as follows:

PLOTS.	PLOTS.
1. Nothing.	1a. 200 lbs. Lime.
2. 48 lbs. Acid Phosphate. 25 lbs. Mur. Potash.	2a. 48 lbs. Acid Phosphate. 24 lbs. Mur. Potash. 200 lbs. Lime.
3. 24 lbs. Mur. Potash. 20 lbs. Nitrate Soda.	3a. 24 lbs. Mur. Potash. 20 lbs. Nitrate Soda. 200 lbs. Lime.
4. 48 lbs. Acid Phosphate. 20 lbs. Nitrate Soda.	4a. 48 lbs. Acid Phosphate. 20 lbs. Soda Nitrate. 200 lbs. Lime.
5. 48 lbs. Acid Phosphate. 24 lbs. Mur. Potash. 20 lbs. Nitrate Soda.	5a. 48 lbs. Acid Phosphate. 24 lbs. Mur. Potash. 20 lbs. Nitrate Soda.
6. 48 lbs. Acid Phosphate. 48 lbs. Mur. Potash. 20 lbs. Nitrate Soda.	6a. 48 lbs. Acid Phosphate. 48 lbs. Mur. Potash. 20 lbs. Nitrate Soda.
7. 48 lbs. Acid Phosphate. 48 lbs. Sulf. Potash. 20 lbs. Nitrate Soda.	7a. 48 lbs. Acid Phosphate. 48 lbs. Sulf. Potash. 20 lbs. Nitrate Soda. 200 lbs. Lime.

These plats are now planted to potatoes. It is proposed to maintain the plats permanently for the purpose of studying the effects of lime on this soil when planted to different crops.

From results obtained in the laboratory and set forth in detail in Bulletin No. 50, it would seem that the soils of the humid portion of our state are not as well supplied with potash as is desirable. In consequence of this arrangements have been made to test the effect of potash on bearing orchards. For the present attention will be directed only to the size, quality and quantity of the fruit. The general plan adopted is as follows:

Five rows of six trees each, all upon the same character of soil are selected for the experiment. If the trees are about 20 feet apart this will make about one-ninth of an acre in the experimental plat. These trees are treated with potash as follows: 50 pounds of the salt mixed with loam is applied to two of the rows adjacent to each other, including half the space to the row adjacent on each side. The third, or center row, is not counted as in the experiment lest it may draw some nourishment from the fertilized row near it. The rows 4 and 5 are to be used as check rows, the fruit being used for comparison with the fertilized rows. The arrangement of the experimental rows will, then, be as follows:

Row 1.	1	2	3	4	5	6	Fertilized.
Row 2.	1	2	3	4	5	6	
Row 3.	0	0	0	0	0	0	
Row 4.	1	2	3	4	5	6	Unfertilized
Row 5.	1	2	3	4	5	6	

Several experiments of this character were planned last year but it was found absolutely impossible to get the horticulturists to give the necessary attention to weighing and sampling of fruit, this attention being required just at the busiest time of the year. This year the number of plats was reduced and brought within the range of our own personal observation. It will be necessary to conduct this experiment several successive years to obtain definite results. The experiment is deemed of importance as potash plays such an important part in sugar development in fruit which our analyses has shown not to be as complete as in those sections of the country where potash is more abundant.

SUGAR BEETS.

Experiments with sugar beets were conducted the past season on quite an extensive scale in several parts of the state. The experiments were mostly confined to Washington, Clackamas, Jackson and Union counties. The detailed results of the season's work are set forth in Bulletin 53. Outside of the analyses of the beets grown at the station 216 analyses of beets were made which gave the following average results: Sugar in the juice, 15.24 per cent, purity, 84.36 per cent, yield per acre, 18.34 tons.

COUNTIES.	Sugar in juice.	Purity.	Yield per acre.	Cost per acre.
Union	18.5	88.5	23.4	$11.20
Jackson	15.5	81.0	15.8	.....
Washington	16.1	86.7	15.7	24.00
Clackamas	13.7	83.4	17.8	26.00

The prices above given do not include rent of land and delivery of beets to the factory.

In Bulletin 53, in accordance with a suggestion from the special sugar beet agent of the U. S. Department of Agriculture, consider-

able attention is given to the manufactures' side of the sugar problem as well as the agricultural side. The co-operative experiments were very successful and served to show conclusively that certain portions of the state are particularly well adapted to the sugar beet industry. We are now ready to state unhesitatingly that Union and Jackson counties possess all the requisites for success in the manufacture of beet sugar. There are also other portions of eastern Oregon that last year gave very favorable results and may prove equally favorable to the industry. In southern Oregon, however, Jackson county is the only one that offers the necessary number of acres suitable to grow beets. The writer has been loath to admit that the conditions in the Willamette valley are rather unfavorable to the industry. This is not due to inability to produce beets rich in sugar and with a good tonnage, but to the inability to keep the sugar in the beet after it is there stored till it can be extracted. This is owing to the comparatively early fall rains which are so injurious to a beet crop. On account of these October rains, which are likely to occur, I fear there would be great opportunity for loss and disappointment to the farmers. Much as I regret to say this, yet I do not feel that the facts will warrant a more favorable report at present. However, a limited number of experiments will be conducted in the valley, not so much to prove the possibility of producing rich beets—for this has been demonstrated beyong question —but rather to investigate more fully the tendency to deteriorate with the coming of rain and the possibility of successfully storing the beets.

The experiments with beets at the station the past season must be considered as practically a failure. The chemical department had in view a test of the relative yield of four varieties and the cost of growing an acre of beets, and a comparison of the weight of the tops with the sugar content of the beet. Seed for this purpose was turned over to the agricultural department for growing the experimental plats of one-fourth acre each, for which portion of the work that department should receive credit. At the close of the season it was found impossible to obtain reliable information on any of the above points because the growing period was cut short by very late planting owing to a heavy rain just at the planting season (May 14), so that the beets, while showing a high sugar content, probably under the conditions it was abnormally high, were stunted in growth notwithstanding the rows were 36 inches apart. The beets

from these plats were by far the poorest that came into the laboratory and entirely unsuited for factory use. However, these beets were analyzed each ten days, beginning August 3d and ending October 23d, 128 analyses being made from the beets on these plats. The stunted condition of these beets is evident when it is known that notwithstanding a fairly good stand was obtained the highest yield was 7.6 tons per acre. The plat, which was subsoiled, gave a yield of one ton per acre more than that which was not. The final results, by varieties and plats, is given below:

VARIETY.	Sugar in juice.				Purity.				Yield.			
	I	II	III	IV*	I	II	III	IV*	I	II	III	IV*
Klein Wanzlebener	18.3	18.4	17.4	18.0	93	93	86	89	7.6	5.6	5.5	7.5
Vilmorin Rose	17.6	19.0	19.5	16.2	90	92	88	89	4.7	6.1	5.6	6.0
Vilmorin Blanche	20.0	17.0	17.0	17.6	91	84	94	87	4.6	4.3	4.9	7.0
Wohanka Vil. Amel.	17.5	16.8	.....	16.5	96	87	....	86	5.0	6.1	5.4	5.5
Average	19.1	17.9	17.9	17.7	92	89	89	88	5.5	5.5	5.3	6.5

Before leaving this subject of sugar beets, I believe the station and the department have the right to a just pride that through its work along this line it has been able to demonstrate to practical sugar men of long and successful experience in this country that Union county is suitably located for this most important industry, and as a result we see there the erection of a factory with the most modern equipment of American-made machinery at a cost approximating $400,000. It will this season and each season pay to the farmers of that county in cash from $150,000 to $160,000 for raw material and will daily throughout its campaign add to the food supply of our people 35 tons of a finished product. If the station did not accomplish another thing for 25 years this one achievement would more than pay the entire expense of this institution. Again I say I believe the station has reason to feel proud of this achievement. I believe it has done more than any other one thing to direct favorable attention to the station.

OREGON FRUITS.

This was another general division of the work proposed for this department. The subject for ease of classification was subdivided as follows:

* Plat IV was subsoiled; otherwise treated same as Plat II.

(1) General investigations of the chemical composition and food value of Oregon fruits.

(2) Investigations as to the most favorable conditions under which prunes may be dried to contain the most nutriment and lose the least in weight.

(3) Composition of the ash of Oregon fruits.

The very large amount of work with sugar beets coming as it did just at the time the prunes became ripe necessarily interfered considerably with work under this head, yet a number of analyses of green fruit were made and experiments were entered upon to determine the maximum temperature which prunes would stand without a rupturing of the sap cells thus causing a drip which is so common with many dryers.

Under (1) there were 17 analyses of fresh prunes made. These analyses were both chemical and chemical physical. On account of lack of space these results cannot be discussed at this time but they will serve as the basis for a bulletin to be issued in the near future. (See opposite page).

Among these prunes were four lots which are worthy of special notice. The prunes were from two experimental plats of 24 trees each, as described under the head of Soils. These prunes gave the results stated below, which must not be taken as a conclusive evidence as to effect of potash, but merely as an indication to be verified in future work. Still, when taken in connection with what is known concerning the potash supply of our soils in general, the results are striking:

Lab. No.	Variety.	Treatment.	Sugar.
1042	Petite	Nothing	8.75
1044	Petite	Potash	14.11
1041	Italian	Nothing	9.28
1039	Italian	Potash	12.67

Whether future experiments will bear out this showing remains to be seen. In addition to these analyses of fresh prunes analyses of 22 samples of dried prunes have been partially completed. This work is in hand at the present writing and will be finished within a few days. These analyses are being made for the purpose of determining the quality and food value of our Oregon cured fruit with the ultimate idea of being able to suggest improved methods of curing.

Laboratory Number.	Variety.	Grower.	Locality.	Average weight in grams.	Number per pound.	Per cent. of flesh	Per cent. of pits.	Flesh.		Sugar.			Terms of								
								Per ct. of juice pressed.	Per cent of pulp.	In fresh flesh.	In juice.	In fresh fruit.	Acidity in juice. SO_3.	Nitrogen in flesh.	Albumenoids in Flesh.	Crude ash.	Water.	Organic matter.	Crude ash.	Total.
973	Italian	J.B.Riddle	Riddle	27.4	16 2	93.95	6.05	80	20	12.50	15.63	11.74		.142	.89	.75	78.18	21.07	.75	100
974	Silver	A.Riddle	Riddle	61.5	7.3	93.89	6.11	89	11	16.67	18.73	15.65	.23	.272	1.70	.53	77.54	21.83	.53	100
975	Italian	J.B.Riddle	Riddle	27.6	16.1	94.50	5.50	65	35	11.80	18.15	11.15	.22			.56	83.55	15.89	.56	100
981	Petite	O.A.C	Corvallis	21.0	15.0	92.86	7.14	74	26	14.30	19.32	13.78	.22							
955	Petite	A.Riddle	Riddle	15.8	28.6	92.40	7.60	76	24	12.60	16.58	11.64	.18							
987		D.Sharpless	Corvallis	23.9	19.1	93.72	6.28	82	18	12.94	15.78	12.13	.22			.58	74.35	25.04	.58	100
1047	Italian	J.R.Shepard	Zena	25.3	17.8	92.30	7.70	88	12					.164	1.02	.83	72.76	26.41	.83	100
1048	Petite	J.R.Shepard	Zena	16.5	27.4	93.49	6.51	70	30	18.68	26.69	17.47		.142	.89	.98	67.49	31.53	.98	100
1049	Petite	J.R.Shepard	Zena	16.3	27.8	94.60	5.40	90	10	11.52	12.80	10.80	.44	.130	.81	.91	68.34	30.75	.91	100
1050	Italian	J.R.Shepard	Zena	25.6	17.7	94.37	5.63	91	9	9.09	9.99	8.58		177	1.10	.89	79.67	19.44	.89	100
1055	Petite	J.R.Shepard	Zena	27.7	17.5	97.29	2 71	85	15	13.31	15.66	12.95		.137	.86	.80	72.83	26.37	.80	100
982	Italian	O.A.C	Corvallis	36.0	12.6			47	53	11.80	25.11		.31				93.44			100
983	German	O.A.C	Corvallis	23.0	19.7	91.30	8.70	87	13	13.39	15.38	12.23	.18							
984	Shanon	O.A.C	Corvallis	38.0	11.9	94.74	5.26			14.11		13.37	.19							
1041	Italian	E.W.Skinner	Springbrook	29.5	15.5	95.08	4 92	54	46	9.28	17.19	8.82	.25			.91	81.09	18.00	.91	100
1042	Petite	E.W.Skinner	Springbrook	22.4	20.2	97.13	2.87	87	13	8.75	10.06	8.50	.45			.59	67.98	31.43	.59	100
1044	Petite	E.W.Skinner	Springbrook	20.3	22.3	98.15	1.85	83	17	14.11	17.00	13.85	.28			1.09	66.90	32.01	1.09	100

Under the head of experiment in drying, as indicated above, an attempt was made to ascertain the temperature at which the sap cells of prunes ruptured in the process of drying. For this purpose a dryer whose temperature was under perfect control was arranged so connected with an air blast that the draught could be equally well controlled. Prunes used in the experiment consisted of Petites, Italians and Silvers, all thoroughly ripe. At the outset special care was taken that the dryer had a perfect draught. The experiment contemplated stopping the operation at the minimum temperature at which the fruit began to drip and having photomicrographs made showing the ruptured cells. The results obtained at the various temperatures are stated below:

1st trial—Temperature of dryer 140° F., no drip.

2d trial—Temperature of dryer 160° F., no drip.

3d trial—Temperature of dryer 180° F., no drip.

4th trial—Temperature of dryer 200° F., no drip.

We were surprised to obtain these results even though the fruit was thrust into the dryer at the high temperatures at the outset of the experiment. These results, different from what we had anticipated, led us to think that the dripping was independent of the temperature. Consequently the experiments were repeated in an imperfect draught and at 160°, 180° and 200° F., considerable dripping resulted, increasing with the temperature. From these experiments we were forced to the conclusion that the dripping of prunes in this case was caused by an imperfect draught rather than the use of too high temperatures as is so often stated.

MISCELLANEOUS.

Under this head is included all such analyses as do not regularly fall under the fixed lines above named. There is an increasing demand upon the department for a great variety of analyses, and it is constantly a question as to what may be included in the regular work. The policy adopted has been to include nothing that was clearly of a personal nature. As an illustration, we are constantly asked to do assaying, but so far we have refused all this work as not belonging within our field. In many of the miscellaneous analyses only partial analyses mere made as it was desired to ascertain the quality of the material for certain specific purposes. In this way considerable time was saved.

HEADCHEESE.

Within the few days following Christmas there occurred several cases of illness—not less than 25—which investigation on the part of the physicians showed to be confined to people who had eaten of a certain lot of headcheese which was made in the country near Corvallis. In many cases the illness was of a serious nature although there were no fatalities. A portion of the headcheese was brought to the laboratory on the Tuesday following the Friday on which the poisoning occurred. I did not receive any definite information as to the time the animals were killed or the "cheese" was made, although indirectly I have been informed that it was on the Wednesday preceding the poisoning. At any rate the meat, when received by me was undergoing putrefaction, so much so that the odor was very bad, particularly when the meat was tested with lime water, which will indicate incipient decomposition even before it can be detected by the odor alone. Hence it would seem that there is little doubt that the meat was undergoing incipient decomposition when the people ate of it, even though it could not be detected by the odor. The gelatinous nature of the meat would render it a particularly favorable medium for the development of bacteria, assuming the poison was developed from that source, although it is not at all certain that ptomaines are due to bacteria, still there is considerable evidence to indicate that to be the case. Whether or not the poison was caused by bacteria, ptomaines were certainly present, as indicated by the recognized chemical tests. With the literature at hand it was impossible to determine anything more definite. The subject is an obscure one in science and little literature of value is accessible.

Fox mentions two outbreaks of choleraic diarrhœa brought about by eating pork in some form, one in 1880 and one in 1881, in the former case more than 72 persons and in the latter 15 persons suffered. The symptoms were the same in all —shivering, headache, thirst, giddiness, faintness, vomiting, diarrhœa and great prostration. In each case there was an incubation period of 12 to 48 hours. In these instances there were a number of fatal cases, and in the blood of each the same kind of bacillus was found. The conclusion arrived at was that "either the bacillus itself or some virus or ptomaine essential associated with it was the active agent." From the chemical tests in the case under consideration it was clear that

ptomaines were present when the meat was examined, and it is reasonably certain that the meat was in incipient decomposition when eaten.

STRAWBERRIES.

There is but little literature touching upon the chemical composition of strawberries. So far as I have been able to ascertain there has been published but one bulletin treating upon this subject, and in the annual reports of the stations there is but one reference to the subject. Some work has been begun along this line and still more is in hand this spring. The analyses so far made are presented below. These together with those in hand this spring will serve as the basis for a bulletin on the subject.

COMPOSITION OF STRAWBERRIES.

Laboratory Number.	Variety.	Average weight.	Per cent flesh.	Per cent hulls.	Sugar.			Acid (as malic).	Nitrogen.	Albumenoids N. x 6.25.	Proximate composition.			
					Grape sugar.	Cane sugar.	Total sugar.				Water.	Organic matter.	Ash.	Total.
844	Michael's Early	2.39	94.47	5.53	3.07	1.59	4.88	1.08	.10	.62	91.52	8.15	.33	100
845	Vicks	10.66	97.27	2.73	3.21	.93	4.14	.95	.18	1.12	81.70	17.91	.39	100
846	Warfield	6.66	96.80	3.20	3.94	1.06	5.00	.89	.11	.69	90.45	9.18	.37	100
847	Glendale	11.30	97.00	3.00	3.27	.88	4.15	1.01	.18	1.12	88.23	11.45	.32	100

PROXIMATE ANALYSIS OF RHUBARB.

	Variety.	Acid in juice as SO_3.	Dry matter.	Proximate composition.			
				Moisture.	Organic matter.	Ash.	Total.
848	Strawberry	.58	6.09	93.91	5.04	.95	100
849	Linnaeus	.77	5.93	94.07	4.46	.97	100

ANALYSES OF LIMESTONES.

Laboratory No.	Sender.	Postoffice.	Moisture.	Insoluble matter.	Iron and alumina.	Lime.	Magnesia.	Carbon dioxid.
....	E.W.Kammers	La Grande	.40	9.81	1.58	50.43	.....	37.50
.....	"	"	.19	.....	7.54	30.66	.....	.....
.....	Turner Oliver	"	.....	.26	.....	51.33	.....	.....
1296	H.C.Perkins	Grant's Pass	.....	3.93	5.75	48.68	Trace	.....
1.97	"	"	.....	83.31	3.32	5.91	None	.....
1298	"	"	.....	2.79	2.79	23.30	19.78	.....
.....	"	"	.....	4.98	Trace	47.01	Trace	.....
1300	"	"	.....	5.49	1.08	54.24	None	.....
592	W.C.Whitney	Baker City	.....	.....	.....	16.11	11.06	.....
593	"	"	.....	.....	.....	44.57	9.44	.....
594	"	"	.....	.....	.....	47.84	.76	.....
595	"	"	.....	.....	.....	52.59	.98	.....
596	"	"	.....	.....	.....	52.65	.87	.....

COMPOSITION OF GYPSUM.

Constituents.	O.R.&N.Co., (From near Huntington) 1289	O.R.&N.Co. (From near Huntington) 1290	H.T.French. (From California.) 1291
Moisture and water of combination	16.29	20.97	.....
Sulfuric acid	39.40	43.36	40.95
Lime	34.20	32.32	.....
Iron and alumina	1.04	.44	.....
Carbon dioxid	5.37	1 49	.....
Insoluble matter	3.70	1.42	.18
Total	100.00	100.00	.....
Pure crystalized gypsum	84.71	93.30	88.04

PARIS GREEN

Among the insecticides used in this state none is more common than Paris green. The sale of this article has wonderfully increased of late, and as is always the case, the increased use of an article is followed by a demand for a lower price. If this article is already selling at a close margin this demand will be met by a reduction in quality. That this is true is evidenced by the advertisement of certain firms to furnish Paris green of any desired strength and at any price. It is not uncommon to receive complaints that the poison does not have the desired effect. The analyses published in Bulletin 49 were for the purpose of determining the condition of the Paris green at present offered to our horticulturists. A few analyses have been made this year as they have been sent to us. A good commer-

cial article of Paris green should contain not less than 50 per cent of arsenious acid. It is a well known fact that commercial green often contains considerable free arsenious acid, owing probably to loose methods of manufacture. The analyses published in the bulletin above referred to show that 44 per cent of the samples were adulterated. The few samples analyzed this year do not show any improvement. The analyses of this year are presented below:

ANALYSES OF PARIS GREENS.

Laboratory No.	Sender.	Postoffice.	Arsenic As $_2O_3$.
843	Snipes-Kinnersley Drug Co.	The Dalles	46.16
854	Snipes-Kinnersley Drug Co.	The Dalles	34.10
855	G.E.Landis	The Dalles	46.60
856	G.E.Landis	The Dalles	66.30
1335	A.B.Cordley	Station	50.34
1339	M.Clemens	Grants Pass	50.99
1340	J.C.Standish	Halsey	55.03
1341	H.A.York	Hood River	48.67

ANALYSIS OF POTABLE WATERS.

Laboratory No.	LOCALITY.	Grains per U. S. gallon.			Parts per 1,000,000			
		Total solids.	Mineral Solids.	Chlorin.	Free Ammonia.	Albumenoid Ammonia.	Total Ammonia.	
703	Salem	7.11	3 87	1 13	.025	.011	.036	Good
704	Salem	11.02	5.95	1.50	.005	.012	.017	Good
701	Sheridan	7.13	4.81	.72	.005	.008	.013	Excellent
798	Salem	3.60	2.33	4.94	.009	.048	.057	Fair
799	Salem	3.19	1.74	4.93	.002	.047	.049	Fair
800	Salem	4.46	2.43	4.94	.034	.004	.038	Good
804	Aurora	5.94	2.55	1.21	.054	.045	.099	Good
1121	Forest Grove	.93		.41	.069	.180	.249	Suspicious
1248	Vale			3.83	.161	1.500	1.661	Very bad
1257	Hillsboro	10.00		1.40	Trace	.180	.180	Fair
1204	Portland	10.63		.75	.065	.210	.275	Poor
1317	Oregon Insane Asylum	12.70		.75	.008	.088	.092	Good
1318	Oregon Insane Asylum	5.00		.75	.021	.114	.139	Fair
1319	Oregon Insane Asylum	7.10		.50	.080	.046	.126	Fair

NOTES.

No. 1317 was taken from the Asylum well situated on a ridge just back of the river flat. The well is very deep.

No. 1318 was from a well at the Penitentiary.

No. 1319 was from a spring in the foothills and is used at the Asylum farm.

In addition to the analyses the tabulations for which are here given, there has been done some lesser work, including 8 analyses of manures for the agricultural department, to be used in an experiment on the preservation of manures; three butters and one canned cream for the State Food Commissioner, one sheep's stomach for the purpose of determining the cause of death of a considerable number of sheep enroute to the east, partial analysis of gluten meal, analysis of dietary waste and salsify in connection with dietary study in the college, determination of a number of minerals.

BULLETINS AND CORRESPONDENCE.

The publications of the department for the year are:

Bulletin 47. The Digestibility of Cheat and Clover (in connection with the agriculturist.)

Bulletin 49. Paris Green and its Adulteration.

Bulletin 50. The Fertility of Oregon Soils.

Bulletin 53. Sugar Beets, 1897.

A set of these publications accompanies this report.

The correspondence of the department is assuming considerable proportions. This may be considered as significant and valuable in more ways than one. First, it indicates an interest in the work of the department throughout the state; second, it indicates a desire on the part of the people for the information they believe us able to impart; third, it acquaints us with an innumerable number of facts and conditions which serve a valuable office in our work. While these inquiries often require no little time and labor to give an adequate answer, yet I believe this method of instruction to be laden with excellent results both to the public and the station.

INSTITUTES.

During the year I have attended and addressed regular institutes at Springfield, La Grande and Baker City. In the interest of sugar beet experiments I have also addressed audiences at Ontario, Medford, Ashland and Myrtle Creek. I also attended and read a paper at the meeting of the Northwest Horticultural Association in Portland. In connection with this matter I desire to say that I believe this institute work is of great importance to the state and to the station, not only in disseminating information, and reaching many people not otherwise possible to reach, but it also brings the station workers in contact with those people vitally interested in the mat-

ters discussed, and who have had much practical experience in their respective localities and are therefore well acquainted with the needs and difficulties in confronting the agricultural people in those localities. From conversation and discussion with them it becomes possible for the station worker to gain much of value as well as give, and in a much more thorough and satisfactory manner than could be done through the medium of correspondence. Further, it tends to bring the station and its work closer to the people and to demonstrate the practical results of scientific work.

FUTURE WORK AND RECOMMENDATIONS.

Work will be continued under the above named heads during the coming year. The experiments with sugar beets will be practically completed this season at which time it will be dropped from one of the principal lines of investigation. Its place will be filled by experiments with sorghum as a syrup crop in Oregon for there are certain parts of the state that I believe offer favorable conditions for this industry. Arrangements are also being perfected to undertake some special work on alkali soils in eastern Oregon, and also to undertake some investigations along the line of human foods and dietaries. With these exceptions the plan remains the same as heretofore described.

I believe there is an exceptionally good field for investigation in soil physics. There are many problems of vast agricultural importance to be demonstrated in that realm of science. It is a comparatively new field of a semi-chemical nature and offers an excellent opportunity for valuable work. Mr. Fulton has gone east for special purpose of studying in this field of investigation. He has always taken much interest in this line and I beg to recommend that soil physics be assigned to him as a special field of work so far as his time is not taken up with class duties, this to bear the same relation to the chemical department as dairying to the agricultural department.

I desire to ask for an alteration in the chemical building which will be conducive to convenience and rapidity of work. Further, the change will practically remove the noxious and corroding gases from the main work room, and give more room for working apparatus. There is now a small dark room in the front of the building now used as a storeroom for glassware. In this are two large flues which would be very efficient in removing the gases above referred

to. At present this room is too dark to be used for anything except storage. My plan is to supply light by means of a window put in the front of the building, which could be made in some artistic design. To remove the hood now in the main room and construct one in the small room which could then be used exclusively as a hood room. This recommendation is made not only an account of the greater facility of work but also for the sake of health for it is very annoying, as well as unhealthful, to be obliged to labor in a room filled more or less of the time with irritating gases. I think this change, together with the necessary plumbing can be done for about fifty dollars.

The cost of conducting the department the coming year will be about the same as during the past year.

In closing, Dr. Gatch, I desire to thank you most heartily for the earnest and friendly interest taken in the work of the department and your kindly advice in many matters.

Yours very truly,

G. W. SHAW.

REPORT OF THE ENTOMOLOGIST.

To President Thomas M. Gatch:

SIR:—I hereby present a synopsis of the work done in the department of entomology during the year ending June 30, 1898.

A full report cannot well be given at this time for the reason that at this season of the year much of the work is still incomplete, and for the further reason that when the results are published they should form the subject of special bulletins which may be illustrated.

The work of the entomologist naturally divides itself into several well defined parts.

1st. A detailed study of certain injurious insects that are attracting unusual attention.

2d. Studies on the life histories of a large number of species of insects that are injurious but which are as yet of only secondary importance.

3d. Experiments with insecticides.

4th. Care of the collection.

5th. Determination of specimens sent in by horticulturists and others from all over the state.

6th. The distribution of information regarding the nature of the various insect pests and the best means of dealing with them.

Under each of these heads the following points may be noted: (1) Probably no other insect has attracted so much attention in this state during the last two years as has the Peach or Prune Twig-borer, *Anarsia lineatella*. So urgent became the demands from prune growers and from members of the State Board of Horticulture for information concerning its nature and the remedies to be used against it that in the spring of 1887 I began to give it careful attention. The results of my work up to the time the bulletin went to press were presented in Bulletin No. 45.* Up to that time, although it had been present in this country since 1860 and had been known as a pest since 1872, the Peach Twig-borer had been considered as identical with the Strawberry Crown-miner. In the above article, however, I first called attention to the great dissimilarity

*June, 1897. This same article with some additions was presented before the ninth annual meeting of the Association of Economic Entomologists, and is published in Bulletin No. 9, New Series U. S. Department of Agriculture, Division of Entomology.

between the larvæ of these two pests and to the different habits of the moths, and stated that "it appears to us very probable that hitherto two very similar but entirely distinct species have been united under the name Anarsia lineatella. This supposition has since been confirmed by Prof. C. H. Fernald, and by Mr. C. L. Marlatt.*

The determination of the specific distinctness of these two pests, together with the knowledge of its life history gained through observation, greatly simplify the problem of controlling the ravages of the twig-borer. In the article above referred to I suggested that the "best and cheapest remedy is to spray the trees with Paris green just as the leaf buds are unfolding, so that the larva's first meal in the spring will be a poisonous one."

Through the courtesy of Mr. J. C. Standish of Halsey, Oregon, we have been able this season to test this remedy upon an orchard which was the worst infested with this pest of all the orchards I have seen. In fact this particular orchard was selected on that account. Mr. Standish generously undertook to bear the entire expense of the experiment and to have the work performed under my direction. Previous to the experiment the orchard had been sprayed about March 25th with Bordeaux mixture, but an examination on April 16th, when the trees were in full bloom showed, as had been expected, that the hibernating larvæ had not been injured by the application. This examination also showed that while most of the larvæ were still in their winter quarters a few had already left them and had attacked the earliest shoots. I, therefore, suggested to Mr. Standish that the spraying be done at once since it would be necessary, if the experiment were to succeed, to have the poison upon the trees when the larvæ first made their attacks upon the young shoots. However, a number of rainy days followed, and it was not until a week later, on the 23d, that Mr. Standish was enabled to begin the spraying, which was not finished until the 28th. Notwithstanding this unavoidable delay the success of the experiment exceeded my expectation.

May 7th I visited the orchard and made an examination of three check trees that had been left unsprayed, and of five adjoining sprayed trees with the following results:

*Bulletin No. 10, New Series U. S. Department of Agriculture, Division of Entomology.

UNSPRAYED.

Tree.	Shoots killed.	Living larvæ found.
No. 1	15	12
No. 2	30	26
No. 3	23	19

SPRAYED.

No. 1	4	2
No. 2	25	5
No. 3	7	3
No. 4	8	4
No. 5	11	4

A glance at the above figures shows that on the unsprayed trees nearly 84% of the infested branches contained living larvæ while in less than 33% of those on the sprayed trees were the larvæ still living. The average number of larvæ on each unsprayed tree was 19 while the average on each sprayed tree was only 6. The above results taken by themselves cannot be said to be entirely satisfactory since they show that nearly one-third of the larvæ were not destroyed by the poison; but that this is due to the fact that the application was made too late is indicated by the fact that while on all of the unsprayed trees larvæ of various sizes could be found, from those which had but recently vacated their winter quarters to those that were nearly full grown, on the sprayed trees almost every larvæ found was nearly ready to pupate—indicating that they had been the first to emerge from winter quarters and had entered the young shoots before the poison was applied. The almost entire absence of the younger larvæ on the sprayed trees, taken in connection with their presence on the unsprayed ones, makes it evident that these borers are readily poisoned if the poison be only applied before they have begun to bore into the shoots. Unfortunately, however, the poison does not act so quickly but that the larvæ are able to bore far enough into the shoot to cause it to wilt at the tip, so that the beneficial effects of the spray must be looked for in the reduction of future injury.

Enough data has been gathered regarding the life history of this insect and the remedies to be employed against it to justify the publication of a bulletin on the subject in the near future.

During our earlier observations on the Peach Twig-borer a comparative study was also made of the Strawberry Crown-miner. The facts thus gathered regarding this pest together with the informa-

tion obtained by study of several other insects injurious to the strawberry, form the basis for a bulletin on strawberry pests which will be issued at some future date.

Other insects which are at present receiving special attention on account of their importance, but on which we are as yet not ready to report, are the Codling Moth, the Wooly Aphis, the Apple Tingis, the Striped Cucumber Beetle, the Peach Tree-borer, Flea Beetles, and the Hop Louse.

(2) In addition to the detailed work on the above insects, observations have been made during the year upon about one hundred and twenty-five species which are as yet of secondary importance.

(3) The experiments in testing various preventatives of Peach Tree-borer ravages in prune orchards which were mentioned in my last report have been continued throughout the year. About twelve hundred trees are under observation and are divided into six plats of two hundred trees each. Five of these plats are treated, each with a different preparation, while the remaining plat is left untreated as a check upon the work. The plan is to carry this work on for several years for the purpose of gaining definite information as to the comparative cost and efficiency of the various substances used.

We have also under way extensive experiments in spraying for the codling moth and hop louse, as well as miscellaneous tests of insecticides designed principally to test the value of various substitutes for Paris green. Several proprietary insecticides that have been sent here for trial are also being tested.

(4) The entomological collection has been increased during the year by the addition of about ten thousand specimens. A large proportion of these has been collected by students but the work of arranging and caring for the collection now forms a not inconsiderable part of the duty of the entomologist. The named collection has been increased by the addition of about two hundred species of Diptera through the courtesy of Dr. L. O. Howard, U. S. Entomologist, who has kindly had named for us a series of specimens sent him during the year.

(5) The entomologist holds himself in readiness at all times to identify specimens of injurious insects which may be sent him by the farmers and fruit growers of the state, and is pleased to note that there seems to be an increasing tendency among such parties to avail themselves of this method of becoming acquainted with their

insect enemies. It is believed that we have in this way accomplished much good, particularly as several members of the State Board of Horticulture have freely availed themselves of this method of becoming familiar with the various fruit pests, and have undoubtedly widely distributed the information thus gained.

(6) As a member of the Station Committee on Farmers' Institutes the Entomologist arranged for and conducted institutes at Monroe, Springfield, and Tangent, and attended others at Halsey, Junction City, Arlington, The Dalles and Hood River. At all of these places illustrated talks were given on entomological topics. One bulletin (No. 48) on Spraying has been issued and a considerable number of articles have been prepared for the horticultural press About three hundred letters have been received and answered. Many of these letters refer to topics with which we are perfectly familiar and take no more time in answering than an ordinary business letter. But it is not at all unusual to receive letters, referring so insects either new or but little known and requiring careful study varying from several hours to as many days, to answer at all satisfactorily. The correspondence of the department, therefore, occupies a considerable portion of the entomologist's time, but we feel that it is one of the best methods of distributing the desired information directly to the parties interested.

Respectfully,

A. B. CORDLEY.

REPORT OF THE BOTANIST.

President Thomas M. Gatch, Director Oregon Experiment Station:

DEAR SIR:—I have the honor to submit the following report of work in this department:

OREGON WEEDS.

A study of the weedy plants of the state with a view to finding out the best methods of destroying them, preventing their spread and diminishing the injury caused to crops. Notes have been made on the aggressiveness, habit of growth, abundance and distribution of common weeds; these are being catalogued and efforts will be made to have the worst ones included in the weed law. Replies to circulars we sent out some time ago show that in mapping weed distribution little relience can be placed on the common names of plants. Specimens of the worst weeds are being collected at different stages of growth and will be mounted with the seeds on cards labeled with both common and botanical names. These will be sent with circular letters to granges and farmers' clubs in various parts of the state.

It is hoped that by sending out labeled specimens exact information will be obtained regarding weed distribution and that the farmer knowing his worst foes will take immediate steps to destroy them on their first appearance without waiting for them to become established.

The importance of this work is shown by the rapid spread of foxglove (*Digitalis purpurea*, L.) along road sides in Washington and Lincoln counties, the Ox-eye or white daisy (*Chrysanthemum leucanthemum*, L.) in Benton and the moth mullein (*Verbascum blattaria*, L.) in Linn county. These are local weeds as yet but if active preventive measures are not taken they will soon be as common as tarweed, (*Madia* sp.,) French pink (*Centaurea cyanus*, L.) fern (*Pteris aquilina*, L.) and dog fennel (*Anthemis cotula*, DC.)

PLANT DISEASES

(a) A series of experiments to ascertain the efficacy of potassium sulphide, Bordeaux mixture, and flour of sulphur in checking the spread of gooseberry mildew are not yet completed. The following is an outline of the work but figures can not be given until the ripe fruit is gathered:.

Experment 1. Efficacy of potassium sulphide solution as compared with Bordeaux mixture.

Ex. 2. Efficacy of flour of sulphur as compared with potassium sulphide solution.

Ex. 3. Efficacy of Bordeaux mixture as compared with flour of sulphur.

Ex. 4. Efficacy of weak solution as compared with strong ones to determine the least strength which will prevent attacks of mildew, or where berries are already diseased will check spread of the fungus.

Twenty-five bushes were thoroughly sprayed with potassium sulphide solutions of varying strength and equal number left unsprayed as checks. Ten bushes were sprayed with Bordeaux mixture and eight were thoroughly dusted with flour of sulphur.

The experiments so far show that potassium sulphide is more effective in checking the spread of mildew than Bordeaux mixture and that flour sulphur is less effective than either. They also show that a dilute solution of potassium sulphide prevents and checks the spread of mildew as well as the more concentrated solutions usually employed. Other experiments to be reported later are:

Ex. 5. Influence of the frequency and number of applications of fungicides in checking mildew.

Ex. 6. Influence of thoroughness of application to determine whether very thorough sprayings pay.

Ex. 7. To determine whether the value of fruit saved by second and third sprayings pays for the extra labor and expense involved.

(b) A series of experiments in collaboration with the chemist to ascertain the influence of various diseases such as scab, leaf spot, etc., on the value of the sugar beet crop.

Ex. 8. To ascertain the sugar production in diseased as compared with healthy beets.

Ex. 9. To determine whether the loss by disease is sufficient to present inducements to spray or otherwise prevent disease.

Ex. 10. To determine the best methods of preventing diseases of sugar beets. This work will be carried on during the summer vacation.

We desire, whenever it is practicable, to visit orchards and vineyards and in conjunction with the cultivators to conduct experiments on a commercial scale in preventing prevalent fungous diseases.

NATIVE CLOVERS.

A botanical study of our native forage plants, especially the clovers.

Ex. 11. To determine the species most likely to prove valuable for forage, their distribution, mode of growth and behavior under cultivation.

Ex. 12. In collaboration with the chemist to determine the nutritive value of the different species and their chemical composition.

Specimens have been preserved for the herbarium and notes made on their growth and distribution. Seeds are being collected and will be planted in plots so that the clovers may be studied under cultivation as well as when growing wild.

PARASITIC FUNGI.

(a) Notes have been made on the prevalence of parasitic fungi and their influence on the growth and vigor of weeds. Some fungi as the white rust (*Cystopus*) on shepherds' purse (*Capsella*), rust (*Coleosporium*) on tarweed (*Madia*) mildew (*Peronosposa*) on wild pea vine (*Vicia*), black rust (*Puccinia*) on pinweed (*Gilia*), etc., prove very destructive to their hosts.

Large patches of the pinweed turn yellow and die without producing seed long before the summer is over; the other plants mentioned appear taller, more slender and paler than the healthy plants and do not mature much seed.

A simple jaring of the plants on a windy day when the spores are ripe seems in most cases to be followed by an increase in the amount of fungus the next season. This work requires further study.

(b) Another line of work is to make as complete a collection of economic fungi as possible preparatory to catalogueing the rusts and mildews of the state. During the past season a large number of specimens have been collected in various parts of the state and notes accumulated on their abundance, distribution and economic importance.

HERBARIUM WORK.

To make as complete a collection of our flowering plants as possible, especially of the weedy, poisonous forage, and other economic species, with notes on their distribution and importance.

The herbarium has been enlarged both by collection and exchange

and a large quantity of duplicate material dried during the summer to be used in obtaining more exact information regarding weed distribution. A set of Oregon grasses was collected and sent to the Agrostologist of the Department of Agriculture and an exhibit illustrating typical weeds and economic plants prepared and exhibited at the State Fair. Similar sets are being prepared for the exhibitions at Omaha and Portland. Considerable attention has been given to the collection and catalogueing of rusts and mildews, and three new host plants have been found.

CLASS WORK.

Since the amount of experimental work accomplished depends largely on the amount of class work, it is thought best to mention that during the spring term the botanist personally taught daily seven classes with a total enrollment of 152 students and occupying six hours of actual recitation work. He is pleased to add that the new course of study by redistributing class work will permit more station work in future.

CORRESPONDENCE.

The correspondence with leading orchardists is an important feature of station work as we thus learn their needs and can plan work accordingly. A large number of letters requesting infomation about medicinal and weedy plants, grasses, plants adapted to certain conditions, the cause and prevention of plant diseases, etc., have been received and filed with copies of answers returned. Many plants have been received for identification and accounts returned of their properties and habits.

FARMERS' SHORT COURSE.

As chairman of the short course committee we prepared for publication Circular No. 2, pamphlet of fifty-two pages containing the announcements for 1898 and the lectures delivered in 1897. The course lasted one month during which time daily lectures were given by members of the station staff.

The following were given by lecturers from abroad:

"The Weather Bureau and its Relation to Agriculture," B. S. Pague, of Portland, January 21st.

"Forestry and Sheep Husbandry," John Minto, of Salem, January 25th.

"How to Make Good Prunes," Dr. A. Sharpless, of Eugene, January 28th.

"Horticulture and its Problems," H. E. Dosch, of Hillsdale, February 7th.

These lectures were well attended, and much interest manifested.

FARMERS' INSTITUTES.

I attended and read papers at four institutes, one in Benton and three in Linn county. Read a paper on Plant Hygiene before the Northwest Fruit Growers' Association in January. Gave ten lectures on Structural and Economic Botany at the Chautauqua Assembly in July and twenty-four on Botanical and Horticultural subjects before the Short Course in January and February.

BULLETINS.

Bulletin No. 51 on Marketing Fruit was issued in March and two are in preparation for early publication, one on Plant Hygiene and one in conjunction with the chemist on Oregon Clovers.

Respectfully submitted,

MOSES CRAIG.

REPORT OF THE FLORICULTURIST AND GARDENER.

To Thos. M. Gatch, Director Oregon Experiment Station:

SIR:—I herewith submit report of work in the horticulture department for the year ending June 30, 1898.

EXPERIMENTS IN GRAFTING.

1. The grafting and budding of various native stocks with varieties of fruit, such as apples, pears, plums, and cherries with a view to determine whether or not some native plants can be found suitable as a stock for working the several varieties of fruits into, and at the same time to give a vigorous growth, and also prove much hardier; and at the same time preventing so much winter-killing of young wood that is so prevalent at the present time.

This experiment will take much time and patience, but will eventually prove of great benefit to the fruit growers of our state.

WALNUT.

2. The grafting of the English walnut into the native black walnut, to determine the feasibility of growing the former nut on the latter. If found successful I believe it will have the effect to increase fruitfulness as well as hardiness of the trees. Attempts have been made this spring at top grafting the black walnut with the English walnut, but without success so far. There have been seed sown in order that we may have young stock for carrying on this work next spring.

GRAFTING THE OAK WITH CHESTNUT.

3. Grafting the sweet chestnut onto the oak stock has been done this spring, but not very satisfactory so far. This work will be prosecuted farther in the fall of this year by budding.

DOUBLE WORKING THE APPLE AND PEAR.

4. The double working the apple and pear for the purpose of proving more fully the effect on the size and quality of fruit.

STRAWBERRIES.

5. Testing the newer varieties of strawberries as to quality and market value.

PRUNE.

6. Cross-pollenation of prunes to determine varieties having the higher powers of fertilizing the flowers. This work has been prosecuted during the spring and notes taken on same.

DEFECTIVE PISTILS.

7. To determine the cause of so many defective pistils on the prune. This work has also been carried on during the blooming season and notes taken.

CHARACTER OF POLLEN.

8. Does the character of pollen affect the character of fruit? Notes are being kept on the above and will be reported upon later.

9. How long does the stigma remain receptive and the pollen retain its vitality? Also, what form or variety of flowers present in the variety?

10. To determine the number of days between the stigma and anther maturing.

11. Is there a prepotency in the pollen from one individual upon another?

STIGMA.

12. Note how long stigmas are out of bloom before anthers shed pollen.

13. To determine the length of time trees are in bloom.

BLOOMING OF TREES.

14. To determine the length of time the several varieties of individual flowers are in bloom.

15. To determine the difference in the date of blooming of varieties of fruit trees.

16. To determine what varieties of plum or prunes bloom at the same time. The above is for the purpose to determine the varieties that can be recommended for cross-pollenizing each other.

SPRAYING FOR SCAB.

17. Spraying in winter for the apple scab was done during the month of February last on half of the experimental orchard, the other half being left so that a comparison could be made this fall.

VARIETY TEST.

18. The testing of 44 varieties of vegetable and flower seed, received gratis from Atlee-Burpee & Co., for the above purpose.

SWEET PEA.

19. The testing of 81 varieties of Oregon grown sweet pea seed, supplied gratis by S. T. Walker, Forest Grove, Oregon.

POTATOES.

20. Testing two new varieties of potatoes, one received from W. H. Maule, Philadelphia, Pa., and one from Mr. Jackson, Philomath, Oregon.

PEACH TREES.

21. The work of testing 15 varieties of peaches, in co-operation with other experiment stations, has been undertaken to determine the hardiness of each race, which are as follows: Peen-to, South China, Spanish, North China, Persian.

APPLES.

22. The testing of 11 varieties of apples in co-operation with the Department of Agriculture, to determine the longevity of trees grafted on different parts of stock, namely, whole cut, top cut and bottom cut.

FERTILIZERS.

23. Experimenting with different kinds of fertilizers on worn-out soils. For this purpose one acre of land has been set apart on the extreme west portion of land set apart for horticultural purposes. These plots have all been planted with potatoes and the several varieties of fertilizers applied to every other plot. The seed on each plot having been weighed, and all plots receiving the same amount of seed in weight, both fertilized and unfertilized.

The above experiment is in co-operation with Professor Shaw.

FERTILIZING FRUIT TREES.

24. Several fruit trees have been treated with different fertilizers with a view of keeping up the yield and size of fruit. For this purpose the prune, cherry, and grape have been used. This work is also in co-operation with Professor Shaw.

CODLING MOTH.

Spraying apple trees with salt and water for the prevention of codling moth was taken up by the wish of Hon. H. E. Dosch, Hillsdale, Oregon.

Respectfully submitted,

GEORGE COOTE.